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AMERICAN JOURNAL OF OPHTHALMOLOGY

CONTENTS

	Page
Original Papers	
The formation of a hole in the macula. Harry Vanderbilt Würdemann	457
The tolerance of light in exophthalmic goiter. Edward C. Albers and Charles Sheard	460
Circinate retinitis. Ambrose Earl Edgerton	463
Iridocorneosclerectomy for glaucoma. Conrad Berens	470
Microanatomy of the eye with the slitlamp microscope. Part II. M. Uribe Troncoso and Ramon Castroviejo	481
Chronic postoperative or posttraumatic retinitis (retinitis serosa). Bernard Samuels	493
A case of high esophoria studied by eye-movement photography. Brant Clark	503
Notes, Cases, Instruments	
Fundus findings in tuberous sclerosis. F. Storchheim and E. L. Taube	508
A graph for recording results in dark adaptation. Jacob B. Feldman	510
A holder for trephine blades and a serrated trephine blade. Frederick O. Schwartz	511
Society Proceedings	
Philadelphia, Minnesota, New England, Chicago, Saint Louis, London	512
Editorials	
The eye in sculpture; The A.M.A. in Kansas City	520
Obituary	522
Book Notices	524
Abstract Department	527
News Items	548

For complete table of contents see advertising page V

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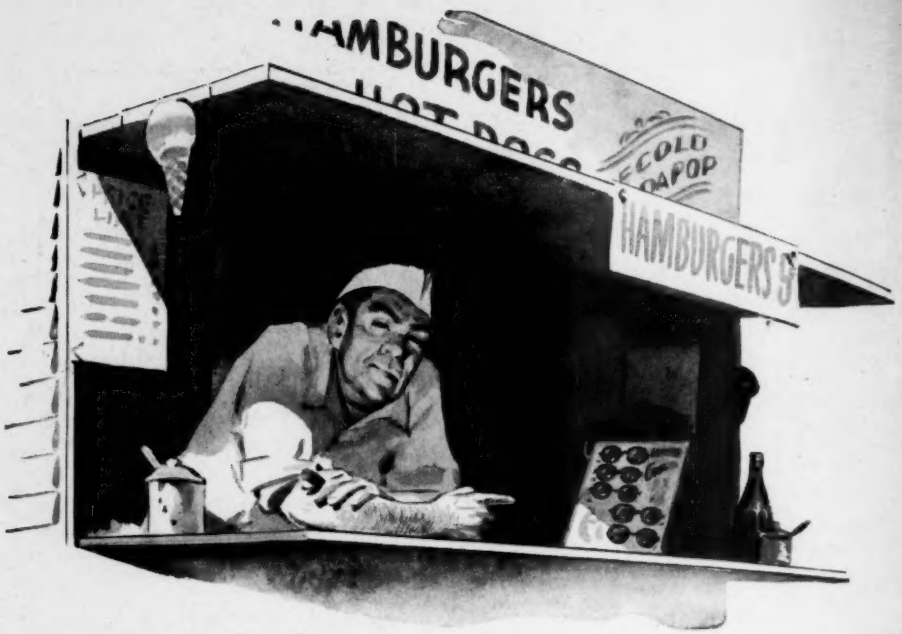

ANY GOGGLES TODAY, MISTER?

In 1934, 20,000,000* people answered "yes" to the roadside stand vendor, the drug store clerk and the garage mechanic. And forthwith twenty million people placed the health of their eyes in the hands of men well qualified to stir up a hamburger, mix a soda or fix a flat, but certainly not skilled in prescribing glare protection for eyes hypersensitive to light.

But even more insidious than the fact that so many people seek eye comfort outside of the profession is proof that most of the 20,000,000 pairs of sun glasses they purchased *had defective lenses and were thus harmful* to vision. The photographs below, showing contrast between images cast by a ground and polished lens and a coquille goggle lens, bear mute testimony to that.

Isn't it time that something be done about it? We think it is. As a manifestation of our good faith we have sacrificed the business available with coquille goggles and since March first we have been selling only sun glasses with ground and polished lenses and only to those in the legitimate optical field. But more must be done and here is the formula we suggest: First, prescribe absorption for every patient whose eyes are at all hypersensitive to light. (We believe Soft-Lite lenses are best for this because Soft-Lite glass is the only neutral glare filter.) Second, prescribe ground and polished slip-overs to every patient for auxiliary sun protection outdoors. Third, educate your patients to the value of ground and polished lenses by means of the same demonstration used in making the two photographs. (Complete information on how you can do this supplied on request.)

Only by our combined efforts in a program of this kind will we succeed. Is the safeguarding of the eyesight of your patients and 20,000,000 other Americans worth your co-operation?

**Figure based upon surveys made by the Better Vision Institute.*

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AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 19 JUNE, 1936 NUMBER 6

THE FORMATION OF A HOLE IN THE MACULA

Light burn from exposure to electric welding

HARRY VANDERBILT WÜRDEMANN, M.D., F.A.C.S., Sc.D.
SEATTLE

The patient, who had been constantly under observation because of a myopia that had progressed but slightly in the course of four years, suffered a burn of the macula from watching the welding of a shovel with an electric torch, at a distance of a few feet. Sight was blurred shortly afterward and the patient consulted the author ten days later. The subsequent history is recorded in detail, eventuating in a typical hole in the macula. Presented to the Puget Sound Academy of Ophthalmology and Otolaryngology, November 19, 1935.

Being so delicate and vulnerable, the macula is particularly sensitive to trauma; especially from contusion injuries, blinding by lightning or electric flashes, and in the trades from exposure to extremely strong light, as in electric welding; also, as has been known for years, from foolhardy attempts to look at the sun directly, as in observation of an eclipse without or through inadequate smoked glasses.

In light and heat burns, the cornea and lens, focusing the glowing object on the macula, act as a burning glass; only a few seconds' exposure being sufficient to destroy the delicate system of nerve elements. In these cases there is a tumefaction at first, with or without hemorrhages, which, after two or more weeks, is resorbed, exposing the ultimate injury, by means of the ophthalmoscope, to the view of the observer. In slight injuries there may be little or no degeneration, but in severe cases a complete loss of the nerve elements occurs and the appearances later seen are those of a true hole in the macula. These conditions are simulated in some cases of malignant myopia and in senile degenerations.[1] The process in injury, however, is much the same, whether it be due to a blow on the eye or from a light burn. Berlin[2] describes its course as first causing a bloody exudate between the choroid and the sclera from which the serum infiltrates the retina. This causes immediate central scotoma without proportional decrease in the periphery of the visual field; and later on, a more or less punched-out appearance of the fovea, with the sclera showing through, is to be observed.

Case report. Miss M. R., aged 16 years, when first examined, was given a prescription for glasses to correct myopic astigmatism on July 31, 1931, as follows: O. U. —6.00 D. sph. ⌯ —.50 D. cyl. ax. 90°, with which visual acuity was 6/6. There was a moderate degree of myopic crescent but no macular degeneration. The patient was seen several times in subsequent years.

She was again examined by me on August 16, 1935, when the correcting lenses prescribed were —6.75 D. sph. ⌯ —.50 D. cyl. ax., 90° for the right eye, and for the left, —6.00 D. sph. ⌯ —.50 D. cyl. ax. 90°, with which vision in both eyes was 6/6, with no macular changes. The eyes were reasonably healthy considering the myopia, it having progressed only slightly in the four years.

The patient was a university student, but during the present summer had been working in Cashmere, Washington, as timekeeper for an assembly dehydrating fruit plant. On September 21, 1935, she took a shovel to the repair shop and looked on at a distance of 4 to 6 feet while a workman was welding it with an electric torch. Shortly

afterwards, the sight was blurred in both eyes and the next day she could not see to read. She consulted me on September 30, 1935, when she could not see the largest Snellen letter with the right eye, but by looking to one side of the letter could see it indistinctly. The other eye showed at this time no evidences of injury and had full vision. Dark glasses, atropine, and rest were prescribed.

Examination, September 30, 1935:

R.E. Visual acuity was —6/60; L.E., with correction, 6/6. The visual field was of normal size but there was a characteristic central scotoma which persisted on later examinations. An almost typical Berlin opacity of the right

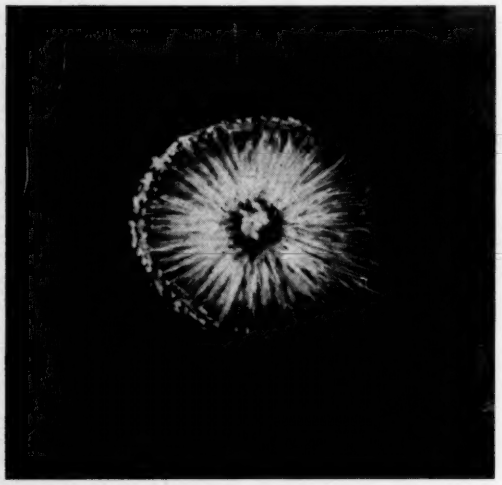

Fig. 1 (Würdemann). Morbus macularis traumatica. Light burn from welding injury. Appearances as of September 30, 1935.

Fig. 2 (Würdemann). Morbus macularis traumatica. Light burn from welding injury. Appearances as of October 10, 1935.

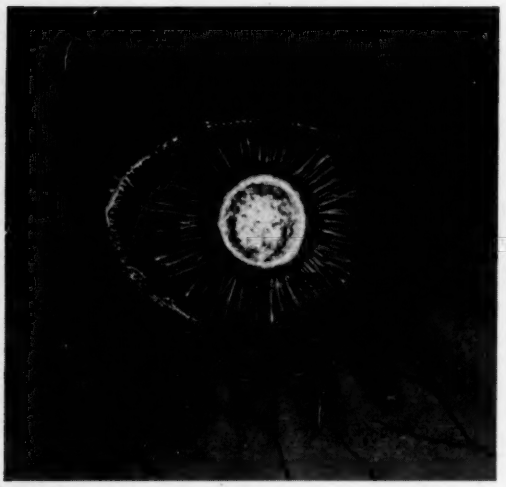

Fig. 3 (Würdemann). Morbus macularis traumatica. Light burn from welding injury. Appearances as of October 14, 1935.

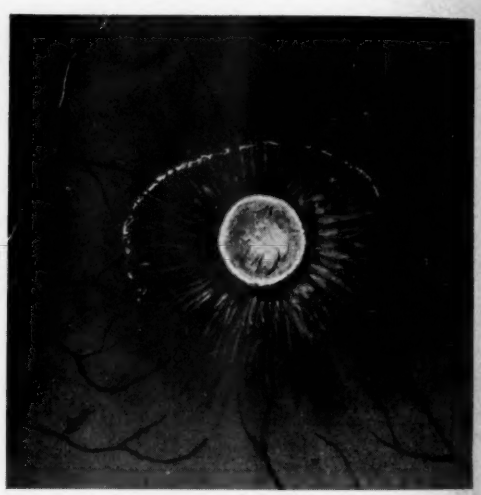

Fig. 4 (Würdemann). Morbus macularis traumatica. Light burn from welding injury. Appearances as of November 14, 1935.

Note: These four illustrations, reproduced in black and white from colored drawings, do not show the fine distinction of the edematous retina.

macula was found. It had probably been slightly different a few days before, but at this time there was edema of the whole macular area with radial hemorrhages showing through the veil. There was a very dark, almost complete ring at the fovea, which looked at first like pigment but as the case progressed proved to be hemorrhage. The vessels leading to the macula nearly entered its rim. One vein, which ordinarily would have been small, and the corresponding one in the other eye was a mere filament, was enlarged and tortuous. The atrophic optic disc with a further cupping and greenish cast. Several small vessels were seen within the fovea.

November 14, 1935:

The appearances had again changed. The vein and venules were still enlarged and the red ring around the fovea had entirely disappeared. The fovea was even more cupped, having a greenish cast and whitish center which changed somewhat on parallax. A few more small blood vessels could be seen therein. The optic disc now showed

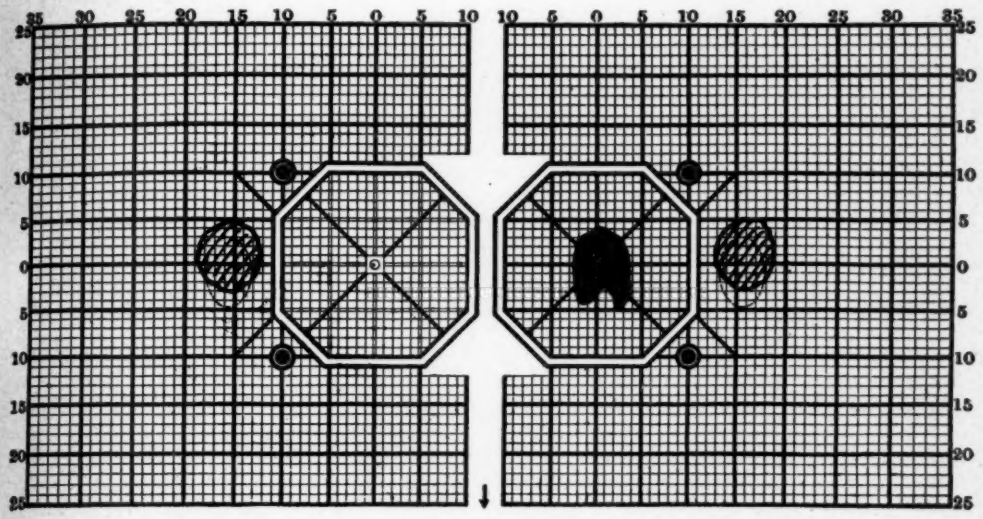

Fig. 5 (Würdemann). Scotometric visual field, November 14, 1935.

light reflex was present but somewhat blurred.

October 10, 1935:

There was further change in that the edema was resorbing and under it could be seen more of the reticulate hemorrhages within the macula. The vein and the venules were apparently larger.

October 24, 1935:

The appearances were decidedly different in that the edema had become almost entirely resorbed, leaving a hemorrhagic ring around the foveola. The retinal vessels were then even larger. The blood within the fovea had entirely disappeared and it had the appearances and size of a glaucomic atrophy of the macular fibers. The appearances observed on this last date will probably remain constant.

The case has run the course of traumatic edema of the retina, followed by a blood exudate between the choroid and sclera from which the serum infiltrated the retina, causing a milk-white evanescent opacity, retrogressing for several weeks, as is described in commotio retinae from contusion. The final appearances are those of a typical hole in the macula.[3]

It will be noted that this was not a contusion case, that there is a clear history of the eye having had 6/6 vision in the previous examinations and that of August 16, 1935, and there was no macular disease nor changes at that

time, such as are found in high degrees of myopia.

The development of such cases is rarely seen by one observer, hence this report which, with the ophthalmoscopic pictures showing the course of the case, is of interest:

320 Stimson Building.

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THE TOLERANCE OF LIGHT IN EXOPHTHALMIC GOITER

EDWARD C. ALBERS,* M.D., M.S. AND CHARLES SHEARD, PH.D.
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The methods and apparatus used for investigating the tolerance of light in nonphotophobic individuals have been employed in a survey of a group of individuals clinically classified as having exophthalmic goiter. Comparative data show that persons with exophthalmic goiter are, in general, much less tolerant of light than normal persons. Glare-out measurements made on a group of persons before and after thyroidectomy show an increase in tolerance of light subsequent to operation. From the Division of Physics and Biophysical Research, The Mayo Foundation. Abridgment of thesis submitted by Dr. E. C. Albers to the Faculty of the Graduate School of the University of Minnesota in partial fulfillment of the requirements for the degree of Master of Science in Ophthalmology. Work done in the Division of Physics and Biophysical Research.

In another communication[1] we presented the experimental results and conclusions concerning the tolerance of light, as measured by glarometric methods, of a group of 144 persons who did not complain of ocular discomfort nor intolerance of light under ordinary conditions. It was hoped that, through the procedures followed, there might be established glare-out frequency distributions for a group of individuals normally tolerant of light which could be used clinically as a quantitative basis in the investigation of those who reported very definite symptoms of photophobia.

The apparatus and method of test used in these investigations concerning the tolerance of light in a group of cases of exophthalmic goiter were the same as those previously reported.

Glare-out determinations on a group of photophobic individuals, clinically classified as having exophthalmic goiter

In a large percentage of cases of exophthalmic goiter, a history of intolerance or hypersensitiveness to light, under conditions which are usually acceptable and are not productive of symptoms nor complaints of photophobia, can be obtained by direct questioning of such persons (Plummer and Rynearson).[2, 3] It is said that, in general, these hypersensitive conditions disappear after thyroidectomy. On this basis, it was felt that measurements of tolerance for light, made by glarometric methods, on a number of persons having exophthalmic goiter would be of academic and clinical interest. A group of 51 cases of this type was investigated and data were obtained to determine whether, in general, the glare-out values for the patients in these cases were lower than they were for the group of persons with normal tolerance of light. The results of these determinations, which were made by employing binocular observation of the fixation target, are shown in the frequency-distribution curve 2 (fig. 1); the corresponding frequency distribution of glare-out values for the normally light-sensitive group is given in curve 1 of this figure.

Table 1 contains the tabulated data for groupings of individuals (within a

* Formerly a fellow in Ophthalmology, The Mayo Foundation; now residing in Champaign, Illinois.

limiting value of 50 foot-candles) in the determination of glare-out values.

The average glare-out value in the 51 cases of exophthalmic goiter was (practically) 200 foot-candles, as compared with an average glare-out value of 380 foot-candles for the group of persons presumably normal in tolerance of light. Of the group of persons who had exophthalmic goiter, only 4 percent had a glare-out value of 350 to 450 foot-candles, in contrast to about 25 percent of individuals presumably normally tolerant of light and glaring-out within this range. Also, within the range of 50 to 250 foot-candles of intensity of illumination necessary to produce glare-out effects, 73 percent of the exophthalmic group exhibited glare-out, as compared with 28 percent in the normal group.

Effects of quality of environmental field illumination on glare-out values

In order to determine whether there were any selective effects or variations in glare-out values among the group of subjects who had exophthalmic goiter, on account of the spectral quality of the background illumination, these individuals were subjected to tests using ground-glass filter predominantly green, amber, and red in color. The procedures, spectrophotometric determinations, and measurements of intensity of the environmental field by photovoltaic photometry, were the same as described in our previous investigations.[1] Curve 1, in figure 2, shows the average values of glare-out in foot-candles (as read directly by photovoltaic photometry and not corrected for spectral sensitivity of the photronic cell used) of the group of individuals normally tolerant of light; curve 2 gives similar data obtained in the group of cases of exophthalmic goiter. It is obvious that the average glare-out values for a group of normally light-sensitive individuals are higher than the corresponding average values for the group of patients who have exophthalmic goiter. These findings give additional support to the conclusion that intolerance of light generally exists in exophthalmic goiter.

Since there is an approximate parallelism of the two curves in figure 2, and since earlier investigations (in which

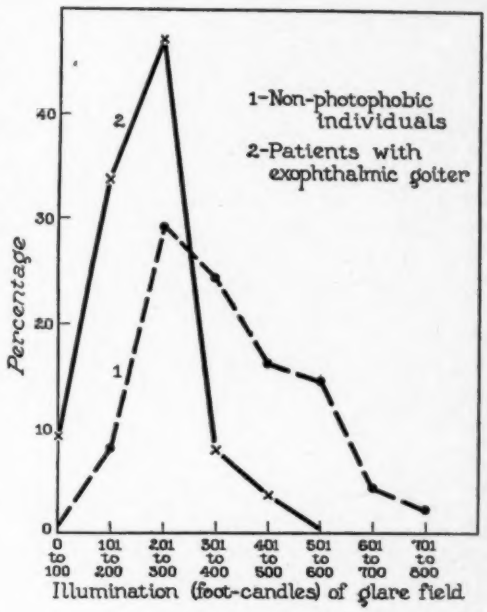

FIG. 1

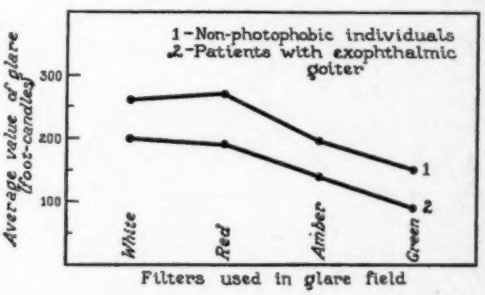

FIG. 2

Fig. 1 (Albers and Sheard). The frequency distributions of glare-out determinations: curve 1, for a group of 144 persons presumably normally tolerant of light; curve 2, for a group of 28 persons who had exophthalmic goiter, prior to operation.

Fig. 2 (Albers and Sheard). Average glare-out values, using various colored filters for changing the spectral character of the glare field: curve 1, for a group of 144 persons presumably normal in tolerance of light; curve 2, for a group of 28 persons who had exophthalmic goiter, prior to operation.

proper corrections were made for the spectral sensitivity of the photronic cell used) indicated that, in cases of normal tolerance of light, there was no de-

pendence of glare-out values on the spectral character of the illumination employed in the glare field, it may be concluded that there is no evidence of a selective spectral effect in the hypersensitiveness to light occurring in exophthalmic goiter.

which there was little or no change or, again, in which the glare-out value may be found to be lower after operation than it was before. The individual data given by the glare-out tests in 21 of the 28 cases in which operation was performed indicated a reduction in sensi-

Table 1

TOLERANCE OF LIGHT FOR GROUPS OF (1) INDIVIDUALS NORMALLY LIGHT-SENSITIVE AND (2) INDIVIDUALS WHO HAD EXOPHTHALMIC GOITER. BINOCULAR FIXATION OF TARGET. (ILLUMINATION ON LETTERS OF TARGET, 6.4 FOOT-CANDLES)

Glare-out values (foot-candles)	1		2	
	Number of cases	Percent	Number of cases	Percent
0– 50	0	0.0	0	0.0
51– 100	1	0.7	5	9.8
101– 150	4	2.8	9	17.6
151– 200	6	4.2	8	15.7
201– 250	28	19.4	15	29.4
251– 300	12	8.3	9	17.6
301– 350	20	13.9	3	5.9
351– 400	16	11.1	1	1.9
401– 450	13	9.0	1	1.9
451– 500	10	6.9		
501– 550	15	10.0		
551– 600	6	4.2		
601– 650	5	3.5		
651– 700	1	0.7		
701– 750	3	2.1		
751– 800	1	0.7		
801– 900	0	0.0		
901–1000	1	0.7		
1001–1100	1	0.7		

Average glare-out value for Group 1, 380 foot-candles
Average glare-out value for Group 2, 200 foot-candles

Measurements on tolerance of light after thyroidectomy for exophthalmic goiter

It was not possible to examine all the 51 patients with exophthalmic goiter, subsequent to operation. However, 28 of them were subjected to glare-out tests within two to three weeks after operation. The average glare-out value was 270 foot-candles after thyroidectomy, as compared with an average value of 200 foot-candles obtained for the entire group of 51 cases prior to operation.

However, it is to be remarked that an average glare-out value does not afford information concerning the values or percentage change in an individual case before and after operation; neither does it indicate the presence of cases in

tiveness to light or, conversely, an increased tolerance of light, which ranged from 5 to 120 percent. Seven of the 28 persons showed, at the time of examination (two to three weeks after operation), a lower glare-out value. In 75 percent of the cases there was a definite increase in tolerance of light, and an approximation to the lower portion of the range of glare-out values which was obtained in 40 percent of the group presumably normal in tolerance of light.

Conclusions

These investigations present evidence to show that:

1. Persons with exophthalmic goiter are, in general, considerably more sensitive to or less tolerant of light than the average person who does not com-

plain of intolerance for light nor ocular discomfort produced by light under ordinary conditions. The data obtained give an average glare-out value of approximately 50 percent of the average value for normally light-sensitive persons.

2. Intolerance of light in exophthalmic goiter is not influenced by or dependent on the visible spectral character (quality) of light.

3. There is, in general, a definite increase in tolerance of light and a reduction of photophobic symptoms subsequent to thyroidectomy. The average glare-out value for the group, investigated before and after operation, was increased more than 40 percent.

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CIRCINATE RETINITIS

Report of a Case and Review of the Literature

AMBROSE EARL EDGERTON, M.D., M.Sc., D.Sc., F.A.C.S.
SAN FRANCISCO

Hutchinson first described this condition in 1876. Since that time about one hundred and fifty cases have been reported in the literature, the majority having been seen in patients over 60 years of age, although several cases have been described in young people. It is not an inflammatory process but a painless degeneration. The prognosis is unfavorable, as the disease progresses in spite of treatment. The cause is unknown but many theories have been advanced regarding its etiology. Some toxic agent is probably an important factor in conjunction with changes in the retinal vessels. The case described is in a woman, 51 years of age, whose fundi showed a typical circinate retinitis.

Hutchinson, in 1876, was the first to describe this condition. Goldzieher, in 1887, described three cases, two of which were unilateral, the other bilateral. He noted that vision was always reduced and that a central scotoma was present. Fuchs, in 1893, reported 12 cases; these he had seen in 70,000 examinations. Ten were in women, two in men. The average age was 60 years. The youngest was 38 years old and the oldest 75. Seven of these cases were unilateral and five were bilateral. In 1894, DeWecker reported 15 additional cases which he had found in 150,000 examinations.

In a typical case, there is a gradual diminution of sight; a central scotoma is always present. As a rule, the patient does not present himself for examination until central vision is gone. Peripheral vision remains normal in most cases. Usually the disc is normal, although the edges may be ill defined. Vitreous opacities, glaucoma, detached retina, and lenticular changes are sometimes seen. In some cases the retinal vessels are normal and as often are sclerosed. The white spots form a broken perimacular circle about the fovea. This perimacular zone may or may not be complete. When it is more or less complete, it is made up of two arches in the form of horizontal arcs, open on the temporal and nasal ends. The third case described by Fuchs, however, was open above and below. These white spots are sharply defined and often coalesce to form larger, irregular, glistening patches. The macu-

lar spot is usually of a yellowish-gray color and between the fovea and spotted circle is an area of normal-colored retina. The retinal vessels pass over the white spots without interruption, but Weeks has seen branches of the retinal arteries pass directly into the white patches. Galeazzi claims that in the early stages of the disease there appear small muddy red spots in the perimacular regions which are easily differentiated from the normal retina. As the disease progresses, various alterations occur between this perimacular zone and the fovea, such as hemorrhages and more spots of muddy retina. Later on, more hemorrhages occur and after a space of time the spots characteristic of retinitis circinata are formed. It may be unilateral or bilateral, and as a rule the light sense is not diminished. Knapp states that in severe cases, the clouded macula suggests a detachment of the retina or retinal thickening but that the rest of the eye ground usually shows no particular change. He did not believe that vascular pathology would explain the retinal changes and stated that the white foci from retinal hemorrhages are different from the white spots in the ring.

Fuchs thought the white flakes to be due probably to a fibrinous exudation into the deeper layers of the retina. He believed it to be a degeneration but was uncertain as to whether or not it might be due to an old blood effusion. He thought the process similar to that occurring in albuminuric retinitis. Weeks saw nine cases and was of a similar opinion. Doyne believed the white areas to be due to decolorized blood. DeWecker regarded the white spots as the result of fatty degeneration of former areas of hemorrhage. Nuel also thought them due to fatty degeneration and limited the site of the exudate to Henle's layer, for this layer is much thicker on the temporal side of the papilla and for this reason the exudate does not occur on the nasal side of the disc. Clausen considered the condition closely associated with Coats's disease and the retinal changes to be due to embolism; Swanzey holds a similar opinion. Gunn believed that the white areas are one of the manifestations of long-continued edema, the size of the ring varying according to the extent of previous affections. Parsons and deSchweinitz agreed with this and the latter suggested that puckering changes occur at the edge of the edematous area, where it comes in contact with normal retina, and the folds assume the picture of retinitis circinata. A readjustment of these folds would explain the disappearance of the white ring as some have reported. He did not think that it follows hemorrhage. Collins and Mayou stated that the disease is due to retinal hemorrhage and that the determining factor in the production of the hemorrhage is thrombosis of some small venous radicle. Goldzieher and Dameno were of the opinion that it is due to vascular changes in the vessels that supply the retina. Benedict did not agree with this because many of the reported cases had been in young individuals, nor did he think that hemorrhage always precedes the white areas. Ammann, who made a histological examination in a glaucomatous eye, believed that the white spots are brought about only by fat-cell clusters between the nuclear layers of the retina, and that these appear where formerly hemorrhage had been found, but only at a time when nothing more of the hemorrhage is to be seen at that point. He stated that agglomerations of white cells correspond to the retinal white spots. Harms stated that the macular changes follow the white spots that go to make up the girdle in some cases. The patient described by Morax had a melanotic tumor of the iris. Histological examination showed that a great deal of exudate, similar to that found in albuminuric retinitis was present in the external plexiform layer and in the internal nuclear layer. Nicoletti believed that the lesions are in the internal and middle layers of the retina.

Paul Junius considered the disease a clinical entity. He believed that the miliary aneurysms in the vessel walls played an important rôle in the genesis of this disease and that recent cases had been noted in generalized angiomatosis.

Seefelder in 1929 reported a case in

a woman, aged 74 years. The blood pressure was 200 and the patient had been well and strong. The left eye showed retinitis circinata, and the right a senile degeneration of the retina. Microscopical observation showed "a girdlelike formation of spots composed of granular fat cells which consisted of altered pigment and glial cells." Marked retinal changes were noted in the region of the macula lutea, where there was total decay of the outer nuclear layer and sensory epithelium, with many fatty and hyaline deposits. The pigment epithelium was markedly degenerated. Connective tissue and fat cells were found between the pigment and choroid. Behind the thickening was a circumscribed hemorrhagic area connected with the choroid. Here and there in the choroid, lymphatic infiltration was observed. The retinal and choroidal vessels were normal. No signs of arteriosclerosis were noted. The changes in the region of these opaque spots, no doubt, came entirely from so called "disc-shaped" retinal disease and the girdlelike formation of spots was secondary. He stated that the phenomena of inflammation could not be considered primary, since, in Ammann's case, it was entirely absent. He concluded that the early appearance of severe disturbance in vision with almost negative ophthalmoscopic evidence pointed to the location of primary changes, not only in the retina, but also in the choroid. Seefelder believed it to be a disease of the retinal vessels in spite of negative observations of the vascular system and that it is limited to the retinal center on account of the vulnerability of the macula.

Leber stated that the degenerative changes are not due to hemorrhage but are dependent upon a uniform though unknown cause. In many cases no hyperemia or vascular changes were noted. He stated that some observers had reported that the white areas in the retina had finally disappeared, giving rise to cholesterin crystals. Vision did not improve, however. Scarlett stated circinate retinitis should not be classed as a distinct entity because of its resemblance to Coats's disease or nephritic retinitis, that some fundamental disturbance of the vascular system seems quite evident, and that some underlying factor is a cause of the vascular disorder. Friedenwald stated that the white masses of glial tissue form a ring-shaped distribution about the macula following the small hemorrhages.

Tuberculosis as an associated condition has been reported in many cases noted in the literature. Lauber reported such a case, as did Spicer, Larsen, Junius, Hippel, and Benedict, yet Knapp claimed that there is no reason to associate the condition either with tuberculosis or syphilis.

Casteran cited a case in a male, aged 77 years, who had a senile macular exudative retinitis in one eye and a circinate retinitis in the other. He suggested that the two retinal conditions might be manifestations of the same underlying cause. Fischer reported four similar cases. DeSchweinitz described three cases of this disease. One, he had observed for a period of three months without noticing any change; the other two cases, observed for a period of one year, showed some changes in the white spots with diminution of vision.

Coover reported a case in a woman aged 62 years. The urine examination and Wassermann reaction were negative. The general health was good. Lenticular changes were noted in each eye. Similar cases have been described by Wölfflin, Neame, Ischreyt, Law, and Hippel; and Begle reported three such cases.

In 1932 Llorca reported a case in a 10-year-old child. Retinal detachment was noted and a glioma was thought to be present; as a result the eye was enucleated. Sections "showed a thickened retina, a caseous cellular subretinal exudate, desquamation of pigment-epithelium cells which were found scattered and more abundant near the retina and adherent to it, no rosettes nor other evidence of tumor, a few hemorrhages on the internal retinal surface but no aneurysmal dilations or suggestions of angiomatosis."

Coutela and Chenet reported a case in a woman, aged 75 years, who was

diabetic. This case showed massive macular hemorrhage as well as many perimacular hemorrhages. Debenedetti reported three similar cases and Maruca described a similar case in a male aged 44 years.

Mosso described a case in a male, 21 years of age, who gave a history of failing vision two years after typhoid fever. This case showed an arteriovenous anastomosis. Deloga reported a case in a male, aged 53 years, who had suffered from cardiac hypertrophy, aneurysm of the aorta, and nephritis. The Wassermann reaction was negative. Four similar cases were reported by Blake and one each by Hartridge, Lawford, and Fridenberg.

Heinricy and Harms reviewed the literature in 1913 and reported 52 cases: five patients had cardio-vascular disease, 24 arteriosclerosis, six showed diabetes, three were luetic, three were anemic and one had leukemia. Nine were free from any general disease. Forty of these cases were unilateral and 12 bilateral. The ages ranged from 24 to 79 years. Seventy-five percent of these patients suffered from disease of the vessels.

Bachshez reported a unilateral case in a woman aged 62 years who had a central scotoma and many vitreous opacities. Similar cases were described by Harms, Vito, Galezowski, Harman, DeWecker and Masselon, Wada, Pollnow, Stella, Seefelder, Fleming, Batten, and Smith.

Rollet and Bussy cited a case in a patient who had suffered from retinitis pigmentosa. Laws described a similar case in a nonsyphilitic male, aged 56 years. This case was bilateral. Cousin and Casteran reported a case in a woman who had high myopia. The patients described by Goldberg and Bruner had a positive Wassermann reaction.

Major W. C. Royals reported a case in a man 62 years of age, who had suffered shell shock during the war and since then had had recurrent retinal hemorrhages in the left eye. When last examined "there was a typical white band surrounding an area approximately three disc diameters in size, centering in the macular region." No cause was found for these attacks of recurring hemorrhage. The other eye was normal.

C. H. Sattler reported a case in 1933, which at first had been confused with a sarcoma. The mass later proved to be a retrochoroidal hemorrhage. After its absorption, a typical area of retinitis circinata was noted.

Doyne and Stephenson reported a bilateral case in a woman, aged 77 years, whose sight began to fail following an attack of influenza. There was no evidence of high tension and the urine was negative. In Jackson's case there was complete disappearance of all parts of the white wreath, but with no restoration of vision. Similar cases have been reported by Weeks, Hartridge, Van Guen, and deSchweinitz.

Bane in 1924 reported two cases. The first was in a woman aged 74 years, and the second was in a male aged 75. Lenticular and pigmentary degenerative changes were noted. Coppez and Davis cited two cases in 1926. The first case showed macular exudative retinitis and incomplete but typical circinate retinitis in each eye. The second case showed bilateral perimacular hemorrhages, which after absorption were replaced by white patches. Coats reported a case, which showed massive exudation in one eye and retinitis circinata in the other.

Junius, in 1932, reported three cases of Coats's disease which he felt sure were of tubercular origin. He also discussed three cases of retino-choroiditis parapapillaris and believed that a definite relationship exists between these two fundus conditions.

Galeazzi, in 1932, reported a case of circinate retinitis in a male, aged 35 years. The general physical examination was negative; the blood and urine were normal. Fields taken showed a normal white field, but colors were contracted and the blue field was inside the red. The central scotoma was on the nasal side but was relative and later became absolute. The blind spot was normal. The Von Pirquet test was positive. He claimed it might occur in young as well as old people and cited the case of

Fumio, whose patient was 13, and one by Wada, whose patient was 23 years of age. DeWecker described a case in a boy of 17 years and Weltert a case in a boy of 12 years.

In 1934, Dr. R. T. Paton presented a case of Coats's disease in a boy, six years of age, in which there was complete retinal detachment of the left eye. The physical examination showed no contributing cause for the condition of the eye. X-ray films of the sinuses and chest were normal and the Wassermann was negative. In discussing this case, Mr. E. M. Josephson stated that in detachment of the retina in Coats's disease, the exudate forms about the vessels and covers them. Engorged veins in the retinal region, not directly involved in the exudative process, are a well-recognized pathologic feature of the disease, while in detachment of the retina from other causes, normal-appearing vessels are found coursing over the surface of the detachment.

Marshall and Michaelson in 1933 reported five cases of exudative retinitis in childhood. They believed the condition to be embolic-toxic in origin and not the result of the preëxisting hemorrhage.

De Petri reported two cases of circinate retinitis in patients with vascular hypertension. In these cases, white spots in a circinate form appeared around the macula, following thrombosis of a branch of the central retinal vein.

Report of a case

The case herewith described was in a woman, aged 51 years, who came to the office complaining of headaches, dizziness, and poor vision. She had worn glasses for the past five years and had been last examined two years ago, at which time her vision was 6/6 in each eye, with corrections. She was wearing a +1.25 D.sph. ⊂⊃ +.50 D.cyl.ax. 180° in each eye, and the fundus examination was negative.

There is a history of hysterectomy having been performed five years ago. Following this operation, a secondary anemia developed and four transfusions were necessary. A short time after leaving the hospital her health had very much improved and continued so until a few months before this examination.

Some albumin and red blood cells were found in the urine; the Wassermann test was negative. The blood count showed red cells, 3,850,000; white cells, 5,301; hemoglobin 60 percent. The blood pressure was 235/140.

The teeth, tonsils, and sinuses were normal, as were also the lungs, abdomen, and extremities. The heart showed some hypertrophy and mitral insufficiency.

The external ocular examination revealed nothing abnormal. Vision with correction in the right eye was 6/60 and in the left 3/60. The ocular tension was normal and the rotations were full and free in all directions. The pupils were 3 mm. in diameter, round, equal, and reacted normally to light and in accommodation. The consensual reaction was present on each side. Oblique examination showed clear corneas and a normal depth of the anterior chambers. The irides were free and reacted actively. Changes were noted in each lens.

Ophthalmoscopic examination of the right eye revealed many punctate changes in the lens, especially on the nasal side. The vitreous was clear; the disc was oval, of good color, and had ill-defined edges. The macular reflex was not present. The vessels showed some tortuosity, with increased light streaks; the veins were irregular in caliber. Numerous small flame-shaped hemorrhages appeared along the course of the superior temporal and nasal vessels. The remainder of the fundus was negative.

The left eye showed lenticular changes. The vitreous was clear, the disc oval, and the edges were somewhat hazy. The macula showed a recent hemorrhage at the fovea, with white perimacular spots forming a double arc, open at the nasal and temporal ends. The white spots were discrete and confluent. No pigment was noted in this area, and the retina between the foveal hemorrhage and perimacular spots was clear. The white spots appeared to be raised and small vessels passed over

some of them. Outside of this perimacular zone, numerous flame-shaped hemorrhages were noted, together with black pigmented spots and areas of retinal atrophy. The vessels, as in the right eye, showed evidence of sclerosis.

After this examination had been made, the patient was taken again to the hospital, where transfusions were repeated.

Conclusions

At the present time, about one hundred and fifty cases have been reported in the literature. The majority of these were seen in elderly people, but many are described in younger patients. It is probable that hemorrhage first appears in the perimacular region and is followed by exudate, which eventually assumes the typical arrangement of retinitis circinata. The grayish-yellow spot in the center of the macula is, in most cases, probably the result of hemorrhage. The white perimacular exudate may disappear and then, later on, reappear. The ophthalmoscopic picture may remain stationary for years, but progressive and regressive changes have often been observed.

It is not an inflammatory process but a painless degeneration. It has been seen in cases of diabetes and albuminuria, arterio-sclerosis, anemia, leukemia, and tuberculosis. Batten's case was associated with glaucoma. In two cases described by Fuchs and in one each by Nitsch and Van Guen, a detached retina was present.

The prognosis is unfavorable, for the disease progresses in spite of treatment, but total blindness rarely results. The majority of patients have been over 60 years of age and show extensive hemorrhages, especially in the later stages.

The cause is unknown, but many theories have been advanced regarding the etiology. Most of the cases reported have shown evidence of arteriosclerosis of the retinal vessels but it is not wholly due to sclerosis, for several cases have been reported in young people. Some toxic agent is probably an important factor in conjunction with changes in the vessels of the retina.

The disturbance of the vessels is, no doubt, an important etiological factor but it is probable that some metabolic disturbances are responsible for both the vascular changes and the deposits in the retina. Many of the cases reported showed such evidence of general or systemic disease and it is very probable that some toxic condition was present which affected the retinal vessels.

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IRIDOCORNEOSCLERECTOMY FOR GLAUCOMA

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The constant modifying of techniques of the older surgical procedures for glaucoma and the presentation of new methods indicate that an ideal operation has not yet been devised. The method here described, with tabulation of results, combines possibly the best features of the Lagrange, Elliot, and Holth procedures together with the excision of tissue in the angles of the wound and the complete closure of the conjunctival wound over a bleb of salt solution. Read before the American College of Surgeons, October 29, 1935, at San Francisco, California. This study was aided by a grant from the Ophthalmological Foundation, Inc.

The occurrence of late infections following the trephine operation and the unsatisfactory filtration resulting in many cases after iridosclerectomy had been performed according to the classical Lagrange method, led to the effort to obtain a broad, evenly diffused, linear, filtering cicatrix. In the majority of cases it is now possible to obtain satisfactory filtration over a broad area. This result has been effected by means of iridocorneosclerectomy, a procedure which includes changes in the original Lagrange technique[1] and modifies the Holth punch operation[2] besides employing a special keratome and a sclerectomy punch with small jaws.

Indications for iridocorneosclerectomy

Iridocorneosclerectomy was first performed on a private patient in 1925, after the operation had been performed on animals and had been tested clinically. It has been successfully employed for the relief of many types of increased intraocular pressure when a filtering operation is indicated. It has proved most successful in chronic, primary, noncongestive glaucoma because the wound does not tend to heal rapidly. In acute congestive glaucoma the wound usually does not continue to filter satisfactorily, but this operation seems to aid in obtaining subconjunctival filtration for a short time. Holth's statement,[3] that since 1916 he has abandoned classical iridectomy as applied to acute glaucoma, suggests that other surgeons also may have been dissatisfied with iridectomy, even in acute glaucoma, and have attempted to obtain more permanent filtration.

The most favorable cases seem to be those in which there are few secondary changes in the iris; for example, atrophy and broad peripheral synechia. Naturally, the results are usually better in early cases with minor field changes and in those in which miotics lower the tension. Some surgeons prefer the trephine operation for secondary glaucoma, but iridocorneosclerectomy seems to be better suited to this type of case because complete iridectomy is easily performed and broader filtration is usually obtained. Also, in secondary glaucoma it may at times be advisable to combine other procedures, as cyclodialysis and incarceration of iris tissue, which are readily accomplished through the iridocorneosclerectomy wound. The procedure has been used several times for glaucoma following cataract extraction and seems to be effective. If broad peripheral synechiae are present, the iris may be perforated by the keratome in an attempt to make the incision, but the same objection holds true for trephine operations. However, when the trephine is used, there is possibly less danger of injury to the zonule and capsule of the lens if the eye is observed carefully for the first sign of perforation of the eyeball. If the keratome is used, the incision is usually farther forward than when the incision is made with a cataract knife. This may have certain advantages in cases where there are extensive peripheral synechiae, and also there is probably less likelihood of prolapse of or injury to the ciliary processes. If broad peripheral synechiae are present it may be advisable to incarcerate one or both pillars of the iris in the wound. Some surgeons believe that iridosclerectomy is contraindicated in patients with exceed-

ingly narrow fields. The visual fields of several patients operated upon were contracted to within 10 degrees. Vision was lost in only one patient, who developed acute iridocyclitis in the eye operated upon and acute glaucoma in the other eye although she apparently had chronic simple glaucoma. No serious immediate postoperative contraction of the field was noted in other cases. Several surgeons with wide experience assert that they have never observed dangerous secondary contraction of the field following iridosclerectomy. If it becomes necessary to perform cataract extraction at a later date, the conjunctival flap is prepared and the wound is opened and extended with Stevens' scissors.

Contraindications

Iridocorneosclerectomy would probably be impractical in cases of buphthalmos when the sclera is very thin. It is also contraindicated if newly formed vessels may be seen on the iris. Although the result in one case of hemorrhagic glaucoma was successful, patients with advanced arteriosclerosis and unusually high blood pressure would probably be unsuitable subjects for this operation. Iridocorneosclerectomy is impractical in the presence of extensive peripheral synechiae.

Instruments and sutures

The instruments and sutures used in iridocorneosclerectomy are illustrated in figure 1.

Technique of iridocorneosclerectomy

After aseptic preparation and injection of the eyelids, inject over each rectus muscle, subconjunctivally, 1-percent procaine with three minims of a solution of adrenalin (1:1000) to each dram of procaine solution. In the operations performed recently, the ciliary ganglion was injected with 1 c.c. of procaine-adrenalin solution. The conjunctiva above the cornea is ballooned with the adrenalin-novocaine solution. With Stevens' scissors, make a slightly curved incision, 15 mm. in length and 10 mm. from the limbus (fig. 2 A) through the conjunctiva to the sclera with the concavity toward the cornea; this flap is dissected from the underlying sclera down to the cornea. The extremities of the incision should be kept at least 8 mm. from the cornea. Fold the flap back over the cornea and then use a flat sharp spud with a rounded end to dissect gently into the layers of the cornea with a side-to-side movement (fig. 2 B). With a blunt spatula between the layers thus dissected, and the conjunctival flap restored to its original position, the point of the spatula should extend 1.5 mm. into the cornea. The eye is directed and held downward with a fixation forceps and an incision is made (fig. 3 A) with a broad hollow-ground keratome*[4] (fig. 3 B). The incision is started in the sclera 1.5 mm. above the limbus and is extended into the anterior chamber until a wound approximately 4 mm. long is obtained. If the anterior chamber is shallow, the incision may be made with a short, narrow, curved glaucoma knife. Some surgeons prefer to use this instrument.

While the keratome is being withdrawn, care is exercised to prevent the iris from prolapsing into the wound. If prolapse occurs, make an attempt to replace it gently with a spatula by pressing on the iris through the conjunctiva. If it cannot be replaced readily, exclude it with a spatula while the punch is being used.

Stevens' scissors are used to extend the angles of the scleral wound for a distance of 0.5 to 1.0 mm., which makes an incision approximately 5 mm. long. The cuts should extend toward the limbus and should allow the introduction of the special scleral punch (fig. 4) into the angles of the wound. With the punch, clip the sclera and cornea (fig. 5 A) as deep within each angle as possible; then clip the remaining lip of sclera and cornea, leaving a serrated edge (fig. 5 B). The wound should extend 0.5 to 0.7 mm. into the cornea, depending upon the size of the opening desired.

A broad two-cut glaucoma iridectomy

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* Made by the E. B. Meyrowitz Company, New York, New York.

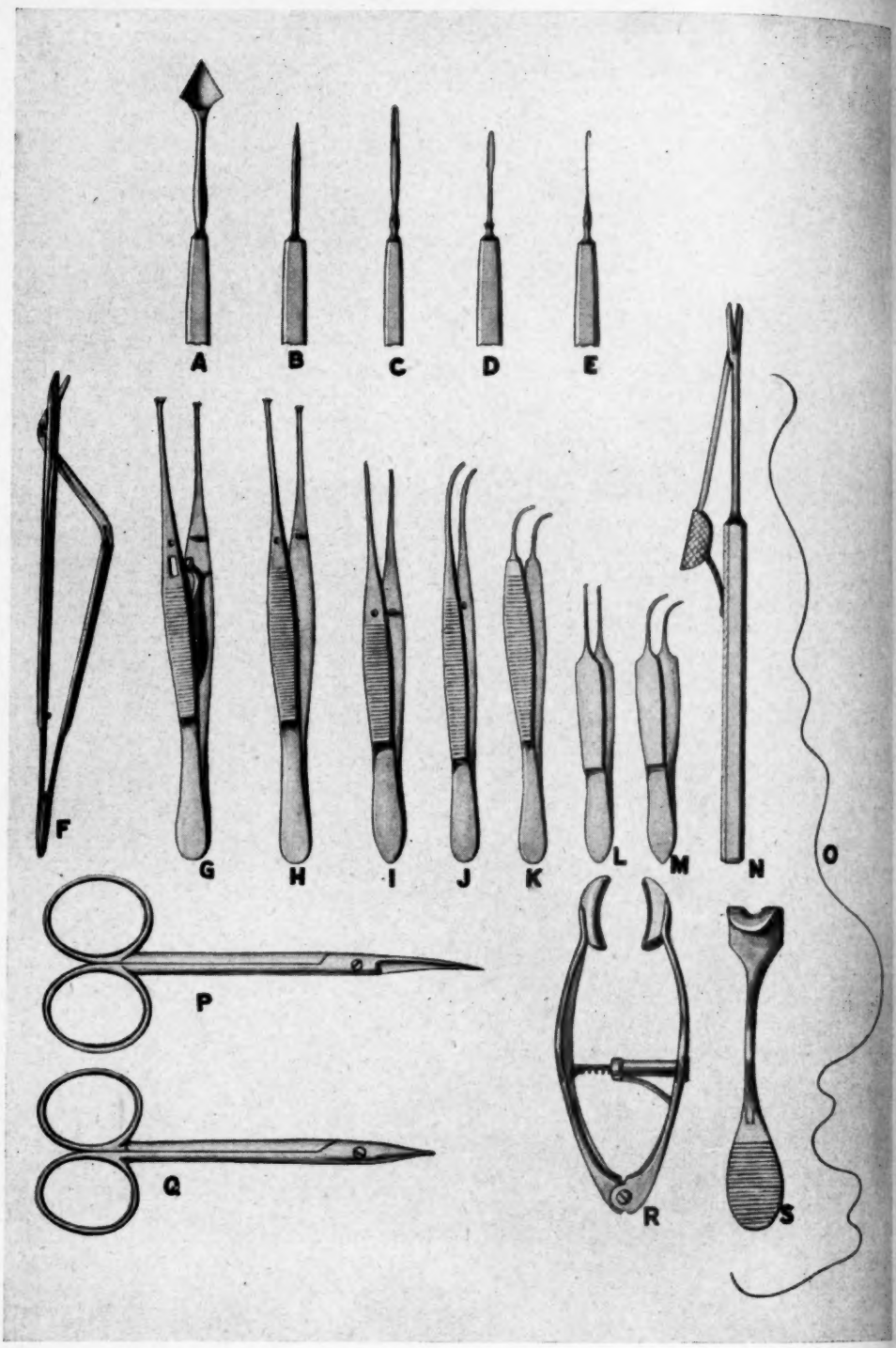


Fig. 1 (Berens). A, hollow-ground angular keratome; B, special short, curved Graefe knife (one for the right and one for the left eye); C, grooved spatula; D, moderately sharp spud; E, Tyrrell hook; F, corneoscleral punch; G, fixation forceps with catch; H, fixation forceps without catch; I, large mouse-tooth forceps; J, clot forceps; K, iris forceps with teeth below; L, fine, straight, mouse-tooth forceps; M, iris forceps with teeth at the end; N, needle holder without catch; O, curved eyeless needle with 0000 plain three-day catgut; P, curved iris scissors; Q, Stevens' scissors; R, solid-blade speculum; S, eyelid everter and retractor.

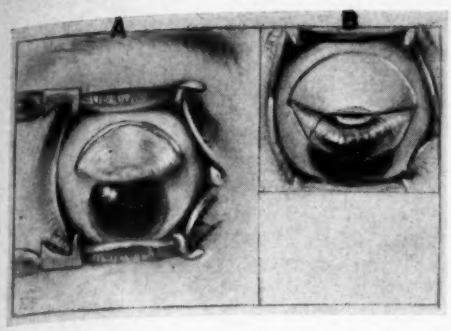


Fig. 2

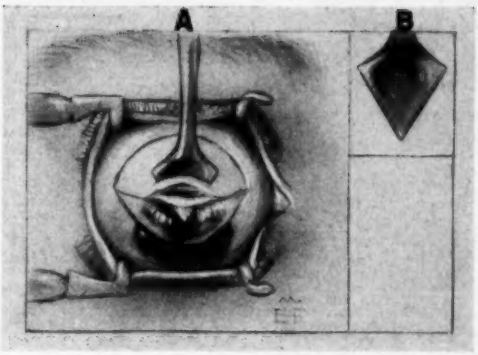


Fig. 3

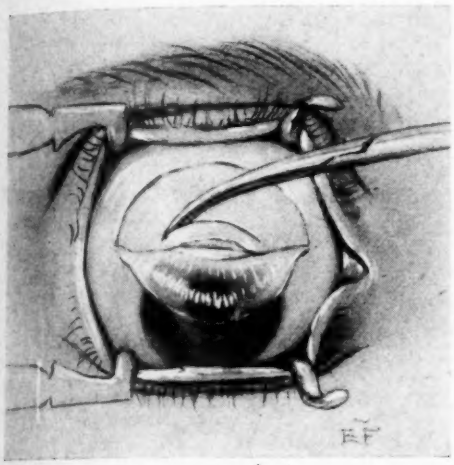


Fig. 4

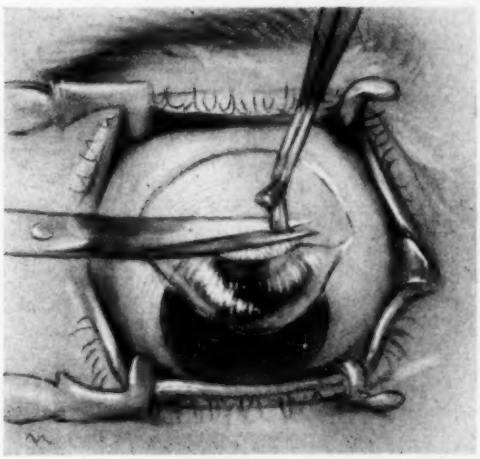


Fig. 6

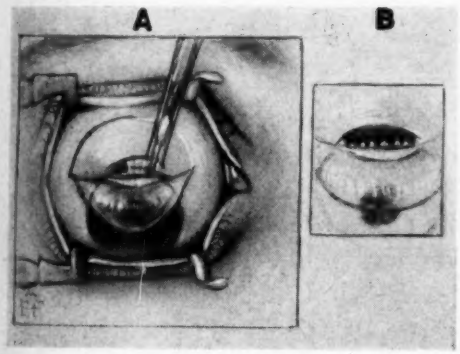


Fig. 5

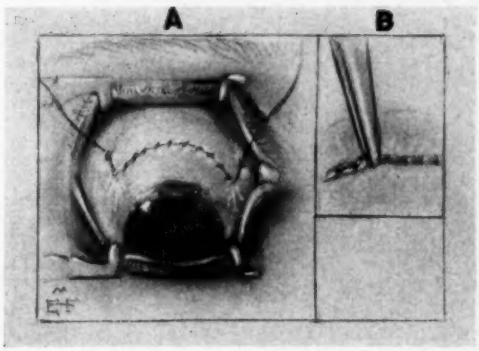


Fig. 7

Fig. 2 (Berens). A, incision in the conjunctiva; B, separation of the layers of the cornea and conjunctival flap drawn down to show separation of the layers of the cornea.

Fig. 3 (Berens). A, keratome incision 1.5 mm. from the limbus. B, hollow-ground keratome.

Fig. 4 (Berens). Extensions in the angles of the keratome wound made with Stevens' scissors.

Fig. 5 (Berens). A, removal of the scleral and part of the corneal lip with special punch. B, appearance of the wound uncompleted.

Fig. 6 (Berens). Completion of glaucoma iridectomy.

Fig. 7 (Berens). A, conjunctival wound closed with running plain catgut suture. B, crushing the wound edges with forceps.

is now performed. After the first cut the iris is torn from the ciliary body by traction forward and toward the uncut side (fig. 6). In selected cases of chronic

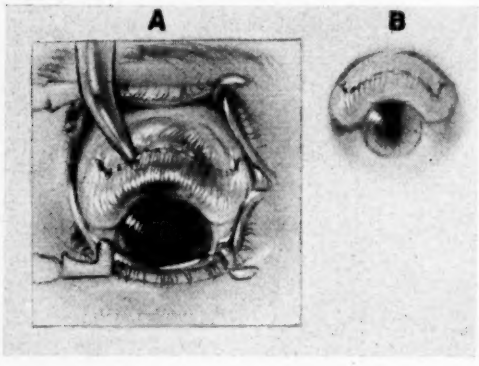
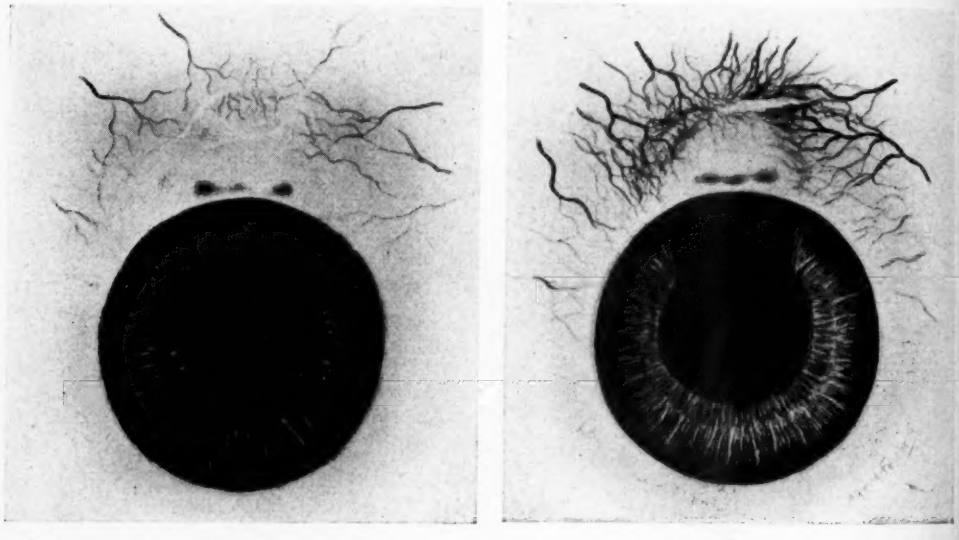


Fig. 8 (Berens). A, tip of anterior-chamber irrigator inserted to balloon conjunctiva with half-normal saline solution. B, appearance of eye after completion of operation.

The conjunctival wound is closed with an over-and-over running[5] catgut suture (0000 plain)*† started with a double bite in the conjunctiva, near the outer canthus of the right eye and the inner canthus of the left eye, as an anchor suture. When the wound is closed, the suture is anchored in a corresponding position near the opposite canthus. The anchored ends should be slightly above the highest point of the conjunctival incision in order to draw the conjunctiva upward (fig. 7 A). After the suture is drawn tight and the wound edges, except at the extremities, are crushed with forceps (fig. 7 B), a grooved spatula is inserted in one angle and an anterior-chamber irrigator, filled with half-normal physiologic saline solution, is placed in the opposite angle and all blood and fibrin are washed from under the flap (fig. 8 A). Sufficient solution should remain under



Right eye Left eye

Fig. 9 (Berens). Filtration obtained with iridocorneosclerectomy in a patient (Mrs. M. E. S.) with chronic noncongestive glaucoma. The left eye was operated on two weeks before the drawing was made and the right eye ten weeks before.

noncongestive glaucoma a peripheral iridotomy or iridectomy may be performed. Replace the pillars by irrigating the anterior chamber with half normal physiologic saline solution while gently stroking the cornea over the pillars of the iris to replace them.

the flap to balloon it forward and to restore the anterior chamber if this is

* Davis and Geck, Brooklyn, New York.

† R. Foster Moore[6] has used the running suture in trephine operations and Gifford[7] has used a running suture of silk to close the wound after iridencleisis.

possible. The extremities of the wound are now crushed and closed with forceps. The ballooned wound should appear as illustrated in figure 8 B. Metaphen ointment (1:2500) is applied over the inner canthus, and one drop of 3-percent atropine is instilled.

Since the ends of the suture have been cut close to the conjunctiva, a Ring or a Guild[8] mask may be applied over the wound without a dressing. The patient should remain in bed with his head elevated.

In from 24 to 48 hours after operation, gentle massage of the eyeball is begun; this is repeated three times each day. On the day following operation the patient is allowed out of bed, and general routine care is administered. Atropine is instilled to keep the iris well dilated and metaphen solution (1:2500) is continued until congestion subsides.

Reasons for departing from the original Lagrange technique

The late infections due to the formation of a fistulous cicatrix* resulting from the Lagrange iridosclerectomy if the wound filters well and the failure to obtain filtration in many cases when the scleral excision was not extensive led to the development of iridocorneosclerectomy. Iridocorneosclerectomy has sometimes been performed with a peripheral iridectomy. Although the visual results were possibly superior in these cases as compared with those in which complete iridectomy was performed, posterior synechiae formed in several cases and the filtration was not so satisfactory as it was after complete iridectomy, probably because the wound did not become lined with migrated pigment.[9] Iridocorneosclerectomy has also been performed with a special small curved Graefe knife** but when this knife is used the scars limit filtration around the cornea unless the conjunctiva is dissected down first; even when this precaution is taken, dissection at the limbus must be broader. This procedure seems to limit lateral filtration; the scleral flap obtained is thick and the resulting filtering wound may extend too directly back toward the anterior chamber, resulting in a wound similar to that obtained with the trephine, but wider. A slightly broader conjunctival flap may be obtained if this incision is made with the curved glaucoma knife, but I prefer the hollow-ground curved keratome which makes a straighter scleral wound than is possible by means of a flat keratome. Dissection into the layers of the cornea and excision of corneal tissue and a portion of Descemet's membrane seem to favor continued filtration.

Advantages of iridocorneosclerectomy

Ballooning the conjunctival flap above makes the dissection easier because it is bloodless and the tissues are thicker. The fact that the conjunctival incisions are kept far from the limbus insures better lateral filtration (fig. 9). Dissection of the flap well down into the cornea, with splitting of the corneal lamellae, permits the use of the punch with no further dissection and carries the incision into the avascular cornea so that bleeding is diminished and there is less tendency for the wound to heal.*

The scleral incision is straighter be-

* Permeable cicatrices may possibly be divided into three groups: the filtering, the fistulous, and the cystoid. While the attempt to differentiate between a filtering and a fistulous cicatrix may be largely theoretical, the filtering cicatrices may be those in which there exist only microscopic channels for the drainage of intraocular fluids.

** Developed after seeing Paton's curved cataract knife for use in cataract operations in patients with shallow anterior chambers.

* Some surgeons believe that endothelium should not reform in the trephine operation[10] if filtration is to be obtained. Elliot[11] believes that removal of part of Descemet's membrane makes it difficult, if not actually impossible, for the gap to be crossed by endothelium. Collins[11a] in discussing W. H. Luedde's paper agrees with this idea. Holth[9] concludes that the best conditions under which the subconjunctival fistula following anterior sclerectomy may remain open for many years are provided when the walls of the defect are covered by uveal pigment epithelium. He believes that this result may be obtained by an ordinary or a basal iridectomy, performed immediately after the sclerectomy. He states that the immigration of the pigment epithelium cannot be depended on, however, and that it never occurs after an isolated anterior sclerectomy, unless there is postoperative prolapse of the pupillary border.

cause of the use of the special hollow-ground curved keratome which permits a longer incision without penetrating the anterior chamber too deeply. The wing incision in the sclera with Stevens' scissors permits the introduction of the punch into the angles of the wound.* The special small punch also facilitates the removal of the sclerocorneal lip well into the angles of the wound and results in a long, narrow scar with a serrated edge which is less likely to heal than is a wound made with scissors. The running suture combined with crushing of the edges of the conjunctival incision causes rapid closure of the wound with wider filtration, which is aided by dispensing with a dressing. Broad filtration is also aided by the subconjunctival irrigation and ballooning of the tissue with half-normal physiologic saline solution.

Results of iridocorneosclerectomy

Tabulation of the results of operations is difficult because of the varying types of glaucoma represented and the unsatisfactory classification of glaucoma at the present time. However, an effort has been made to tabulate the results of operation in order to compare them with results obtained by other methods.

Discussion of table 1. The duration of observation of these cases ranged from four months to 11 years. It is to be expected that the percentage of success appears to be greatest in the 38 eyes with primary glaucoma. These were unselected cases and not those in which tension could be reduced to any specified figure by miotics. Since most authors neglect to state the figure to which tension was reduced in order to be considered a success, it is probable that the percentage of successful results with iridocorneosclerectomy is as high as any recorded for iridosclerectomy. The number of successes obtained in secondary glaucoma is encouraging but the acute-glaucoma group is too small to justify the drawing of conclusions. An average of the results obtained in the three groups included in table 1 is as follows: tension normal, 81.1 percent; tension reduced to 35 mm., 4.5 percent; tension neither reduced nor increased, 14.4 percent.

Table 1

RESULTS FOLLOWING IRIDOCORNEOSCLERECTOMY 73 OPERATIONS ON 50 PATIENTS (68 EYES)

Tension	Primary Glaucoma (38 unselected eyes) (percent)	Secondary Glaucoma (26 eyes) (percent)	Acute Glaucoma (4 eyes) (percent)
Normal (30 mm. or less)	86.8	73.1	75
Reduced to 35 mm.	5.3		25
Not reduced or increased	7.8	26.9	

Discussion of table 2. In several eyes

Table 2

THE OPERATIONS PERFORMED BEFORE AND AFTER IRIDOCORNEOSCLERECTOMY IN 68 EYES

Number of Operations Performed Before Iridocorneosclerectomy	Number of Iridocorneosclerectomy Operations Reported	Number of Operations Performed After Iridocorneosclerectomy
Preliminary iridectomy: 1	73 (68 eyes)	Paracentesis: 5
Extraction after preliminary: 1		Enucleation: 2
		Modified iridotasis: 2
Posterior sclerotomy: 2		Trephining: 2
		Cataract extraction:* 1
		Posterior sclerectomy and partial iridocorneosclerectomy: 1
		Posterior sclerotomy: 1
		Anterior sclerectomy and capsulotomy: 1

* Patient with cataracts secondary to Dinitrophenol intoxication.

* Luedde[13] prefers an irregular slitlike opening which he obtains by making a narrow, winged scissor incision backward into the sclera.

Table 3

RESULTS OF OPERATIONS FOR GLAUCOMA PERFORMED BY VARIOUS SURGEONS

Operation	Number of Cases	Success (percent)
Trephining with Tenon's-capsule graft[a]	19	95.0
Iridotasis[b,c,d]	124	91.1
Iridosclerectomy (Lagrange)[e,f]	149	88.5
Holth sclerectomy[g,h,i,j,k]	376	75.0
Sclerectomy (Lagrange)[f,l,m]	521	69.4
Trephine[e,i,j,l,n,o,p]	593	68.9
Iridectomy[e,i,j,m,p,q]	545	49.5
Small-flap sclerotomy[j]	5	40.0
Cyclodialysis[e,q]	948	26.1
Total Number of Cases	3280	
Total Average		67.0

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it was necessary to perform other operations following iridocorneosclerectomy. Two iridocorneosclerectomies may be performed above provided the first incision is placed temporally or nasally to the vertical meridian of the cornea. Trephining was also performed below in two cases after iridocorneosclerectomy failed to reduce the tension satisfactorily.

Discussion of table 3. Statistics are of little value in the study of glaucoma unless the exact type of case operated upon is known and data are available in regard to the preoperative and postoperative visual fields and other findings. For example, in Knapp's series of 95 cases in which he performed Lagrange's iridosclerectomy, he was careful to state that these were selected cases in which the tension could be lowered to 35 mm. by using miotics.

Table 3 seems to indicate that the highest percentage of success (95.0 percent) was encountered in trephining with Tenon's-capsule graft although the number of cases is small in comparison with other groups. Iridotasis with 91.1 percent successful results is next in order, and is followed by iridosclerectomy (Lagrange) with 88.5 percent of the cases recorded as successful. With Holth's sclerectomy favorable results were obtained in 75 percent of the cases. Lagrange's sclerectomy operation resulted successfully in 69.4 percent of the cases and favorable results were indicated in more than 68 percent of the cases in which trephining was performed; when iridectomy, a small-flap sclerotomy and cyclodialysis were employed, the percentages of successful results were respectively 49.5, 40.0 and 26.1. The total number of cases recorded in this table is 3,280 and the percentage of cases in which successful results were reported is 67.0.

Complications

In one patient with microphthalmos, incipient cataract, and glaucoma, the lens was extruded through the wound; the lens in this case was much smaller than normal. This complication was also reported following a trephining operation.[13]

In another case, a thin filtering bleb

ruptured three times. This bleb probably developed because the wound was made with a Graefe knife, which produced a posterior scleral lip directed almost straight back into the anterior chamber; this, combined with too great excision of the anterior lip, produced a wound similar to that made by a trephine. Varying degrees of iritis are commonly observed and are treated by the usual methods with further search for foci of infection. Hemorrhages sometimes occur at operation and at later periods; these are treated by prescribing rest and special measures indicated by physical examination and laboratory studies.

In the majority of cases of acute glaucoma only one operation was required, even though there was a temporary rise of tension postoperatively in some cases. Injury to the lens was observed in one patient with an incomplete iridectomy. The anterior cortex probably was traumatized in attempting to complete the iridectomy. The resulting cataract was only partial but interfered slightly with vision.

History of iridosclerectomy operations

Since 1855 when von Graefe performed the first iridectomy for the treatment of glaucoma,[14] modifications and variations have been suggested by many surgeons.

The term "filtering cicatrix" was introduced by de Wecker, who published his sclerotomy operation in 1867. He believed that in absolute glaucoma iridectomy was useless and in some cases even harmful.[15]

Iridosclerotomy[16] was first described by Panas in 1883 and the combined sclerotomy (sclerotomy with iridodialysis) of de Wecker was published in 1894.[17]

None of these operations proved generally successful and great interest was aroused by the Lagrange[1] iridosclerectomy operation, which he recommended only for simple chronic glaucoma.

In order to obtain a filtering instead of a fistulous wound Herbert[18] made one or both lips of a small corneoscleral incision as jagged and uneven as possible by means of sawing movements with a narrow Graefe knife but his final results were uncertain.

Bettremieux, in 1907,[19] performed a simple anterior sclerectomy, which Lagrange and other ophthalmologists maintained could not produce a filtering scar.

Sclerectomy with punch forceps was first performed in June, 1908, by Holth,[2a] the Graefe knife or the keratome being used to make the section. When the Graefe knife was used, the conjunctival flap was cut with the scleral section. If a keratome was used a flap was made and a piece of the anterior or posterior lip of the scleral wound was excised with Holth's punch forceps. No corneal tissue was excised.

Brooksbank James[20] used Beer's knife to make a scleral incision 1 mm. from the limbus after dissecting down a flap; he then removed the anterior scleral lip with scissors or preferably with punch forceps.

Sclerectomy with the trephine was suggested by Elliot in August, 1909,[21] and by Fergus[22] in the same year. At that time Elliot had operated on 50 eyes.

Subconjunctival sclerotomy was recommended by Bjerrum in 1909.[23] In this operation a narrow Graefe knife was used to make the incision; puncture and counterpuncture were placed at the limbus, and the incision completed obliquely, so that the knife emerged through the sclera from 3 to 6 mm. from the limbus of the cornea, either above or below.

In 1912, Mayou[24] and Zorab[25] both recommended the operation of "thread drainage." A silk thread which was left permanently in place was introduced through the sclera into the anterior chamber; the end or ends of the suture were buried beneath a conjunctival flap.

A modification of the Elliot and Lagrange techniques, described by Priestley Smith in 1913,[26] stressed as its objectives iridectomy and fistulization of the anterior chamber. The operation included Elliot's conjunctivo-corneal flap, but instead of a trephine hole, a keratome incision was notched on its anterior lip.

In spite of the criticism of simple iridectomy for chronic simple glaucoma, a broad iridectomy and large conjunctival flap, the incision being made with a broad keratome, were advocated by Reese in 1923.[27]

Luedde,[12] in 1924, advocated a winged incision perpendicular to the scleral surface.

In 1927, Wilmer[28] suggested the use of Tenon's-capsule graft in the conjunctiva with trephine operations. The graft has proved satisfactory in several of my cases. I have used Tenon's-capsule graft in conjunction with a trephining operation in one eye and iridocorneosclerectomy in the other eye with satisfactory results from both operations. Two iridocorneosclerectomy operations have been combined with the Wilmer graft with successful results. Wilmer most recently advised the use of the graft only when there is an extremely thin conjunctival flap or an accidental perforation. It seems to me to be equally applicable to fistulous scars which tend to perforate.

Suprachoroidal iridotasis or intraocular iridencleisis, which from a mechanical standpoint is a combination of nearly all the filtration operations, was introduced by Mauksch in 1927.[29] This operation included sclerotomy, cyclodialysis, and iridectomy.

Excellent results in the treatment of chronic glaucoma were claimed by Greenwood[30] who combined iridencleisis and sclerectomy.

In a study of fistulas following anterior sclerectomy, Holth[9] disapproved of anterior sclerectomy combined with iridencleisis because of the thinness of the limbal conjunctiva and the resulting secondary infections. He preferred an extralimbal subconjunctival keratome section opening from 2 to 3 mm. behind the limbus, combined with iridencleisis. In this procedure, the conjunctiva over the scleral incision is much thicker and at the same time the ciliary body is protected against secondary atrophy of the scleral beak. He stated that he had also abandoned anterior sclerectomy not only because of relatively frequent late infections, but also because in many cases after several years the defect in the sclera might be completely obliterated by solid and impermeable scar tissue. The tension might then be increased to such a degree that miotics would be ineffective.

In 1933, Spratt[31] added another variation by introducing his pocket-flap sclerecto-iridodialyis for glaucoma.

Although practically all the principal points in the technique of iridocorneosclerectomy have been used by other surgeons I have been unable to find a description of a technique which includes all the features of this operation. The number of procedures recommended since the publication of the trephine operation and iridosclerectomy seems to indicate that the ideal operation for glaucoma is yet to be devised.

Summary and conclusions

The technique for iridocorneosclerectomy which has been described possibly combines the best features of the Lagrange iridosclerectomy (the broad filtering scar and complete basal iridectomy), the Elliot trephine operation (the excision of part of the cornea which tends to maintain filtration), and the Holth punch operation (a ragged wound which favors filtration), and in addition the excision of tissue in the angles of the wound and the complete closure of the conjunctival wound over a bleb of salt solution. The procedure has been used in, and seems to be applicable to, the treatment of practically all forms of acute and chronic glaucoma, whether primary or secondary.

Iridocorneosclerectomy usually produces a more evenly diffused, filtering cicatrix than the single fistulous bleb of the trephine operation. Although the trephine wound may filter, the conjunctival covering may become so thin that rupture and infection occasionally occur. Crushing the edges of the conjunctival wound in combination with suturing produces complete conjunctival closure which permits early, firm massage. Ballooning of the conjunctiva and the omission of the dressing also aid in maintaining drainage. Complete closure of the wound reduces the danger of exogenous infection to a minimum and leads to early reformation of the an-

terior chamber and restoration of normal intraocular relations. This encourages drainage of the intraocular fluids through the normal channels.

Successful results following iridocorneosclerectomy were recorded in 86.8 percent of the 38 unselected eyes with primary glaucoma, in 73.1 percent of the 26 eyes with secondary glaucoma, and in 75 percent of the four eyes with acute glaucoma.

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MICROANATOMY OF THE EYE WITH THE SLITLAMP MICROSCOPE

I. Comparative anatomy of the angle of the anterior chamber in living and sectioned eyes of Mammalia. Part II.

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NEW YORK

Part II of this extensive study describes the angle of the anterior chamber as observed by means of the gonioscope and by microdissection in the pig and sheep (Ungulata) and in the dog and cat (Carnivora). It includes a comparison of the details of the angle as seen in Rodentia (described in part I) and Ungulata; also of the angle in Ungulata and Carnivora.

In part I, published in the preceding issue, appeared a description of the angle in Rodentia as well as all of the illustrations, the complete summary, and the bibliography.

Part III, to follow in the next issue, will conclude the study with a discussion of the findings in primates and man.

From the Institute of Ophthalmology, Columbia-Presbyterian Medical Center.

II. UNGULATA

The following animals will be considered in this group: pig, sheep, and ox.

2. PIG.

Gonioscopy: The surface of the iris has a yellow color with golden reflexes and numerous, regularly scattered spots of brown pigmentation (fig. 8). A furrow marks the separation between the pupillary and ciliary zones, and others, smaller, show the place of the contraction folds. Following the surface of the iris (I, fig. 8) the angle appears at first as a dark line bounding the iris border, but upon moving the gonioscope to focus the sinus of the chamber, a row of stout, yellowish teeth (PL) appear. They run from the border of the iris to the scleral wall and resemble very closely the teeth of an inverted comb. The color of these teeth varies from yellowish to white and the majority are covered with dots of brown pigment. Their insertion into the iris is made by single, double, or triple broad conical bases, while the apices are attached to the corneo-sclera in a regular manner below a white, narrow line (B, fig. 8). The teeth bridge a cleft between the iris and the sclera which gives a black background to the fibers. Above the scleral insertion of the latter there is a horizontal band made of several rows of streaks of pigment varying in length and thickness (A, fig. 8). The bluish-white sclera gives them a light background. Farther up a dark-blue line, OR, marks the place of the sclero-corneal junction outside. Above this line are seen first, the lower part or concavity of the cornea, bluish yellow in color, and finally the optical section or the cornea, C.

Microanatomy: Following the gonioscopic examination the eye was enucleated, hardened in 10-percent formalin, and sectioned. The angle was examined first from in front in a dry section on the special stand (fig. 1) with ×15 and ×30 magnifications. It is not easy to see the pectinate ligament if the iris has not been previously depressed with a probe, especially when the section does not contain the lens, for the iris has a great tendency to relax into folds. With the iris pushed down, the pectinate ligament finally appears in front and its resemblance to the teeth of a comb is striking (figs. 9 and 10, P). The background of the teeth is white and only near the edge of the section, when the

cleft is seen laterally, does it appear black. Above the pectinate, in dark-coated animals, the band of pigment streaks has the same aspect as in the gonioscopic picture; the streaks are partly superficial and partly seen by translucency, the pigment being deposited in the corneal substance. The cornea, C, appears in the section to have considerable breadth and its blue color contrasts sharply with the white sclera. Bowman's membrane outside and Descemet's inside can be easily recognized.

The angle is then observed on the edge of the section, using first diffuse and then more and more concentrated light. The comparison between the findings with the gonioscope and those with the slitlamp from in front and from the lateral aspect is most interesting. In fact, the anterior view could not be fully explained were it not for the correspondence of the anatomical details with those noted at the border.

(1) *The sclero-corneal junction.* The limits of both membranes are very clearly seen at the border of the section, especially in specimens under water. The junction and even the strands of the pectinate are different in the vertical and horizontal meridians of the eyeball, due to the oval shape of the cornea and iris. This asymmetry of the structures has been recorded by several authors (Ovio, T. Collins, Henderson, and others).

In the vertical meridian (fig. 9) the cornea ends in a long slant, its inner border jutting backwards to the level of the pectinate and even to the external wall of the sinus, while outside it reaches only to the conjunctival insertion, which is marked by a continuous, narrow, pigmented ring, the outer or circumcorneal pigment ring. This is seen by translucency and corresponds to the dark-blue line, OR, in the gonioscopic picture (fig. 8). The white, brilliant, wavy fibers of the sclera, Sc, can be seen running upward to the edge of the slant, the longer external ones reaching to the conjunctival insertion. The sclera thickens considerably at the level of the sinus and then becomes thinner than the cornea.

Inside the sclero-corneal junction and lining the external wall of the sinus there is a great amount of pigment in dark-coated pigs. When observed directly and by translucency through the cornea, this accounts for the brown horizontal streaks seen with the gonioscope.

In the horizontal meridian the corneal slant is less acute. The line of junction is dented with interlocking linear scleral projections (fig. 10), but in light-coated pigs there is no pigment here and no circumcorneal pigment ring.

(2) *The cilio-scleral sinus.* Under high magnifications the section shows a broad cleft between the ciliary body and the sclera, much larger and deeper than in the rabbit, but filled with tissue instead of apparently empty. In the vertical meridian the stout, conical, white strands of the pectinate can be seen attaching the iris border to the cornea, just at the end of Descemet's membrane (fig. 9, P). The upper rows, which are thicker, form the suspensory ligament of the iris, also called "pillars" of the iris by some authors. They meet the corneal wall at almost right angles and form the visible angle of the anterior chamber, but in reality the cilioscleral sinus is a continuation downward of this cavity. The lower rows of pectinate fibers, instead of being separated, as in the rabbit, form a dense meshwork which spreads throughout the whole length of the cleft. These fibers are thinner, highly pigmented and interlace freely with each other, closely resembling a sponge, with large apertures, a cavernous tissue (T. Collins) or an areolar structure. They may be named the spongy tissue (fig. 9 at S). The clearness and beauty with which this meshwork can be seen with the slitlamp microscope shows how vastly superior is this method of examination, for natural colors, minute appreciation of depth, and varied lateral planes of observation give a much more accurate idea of the structural arrangement than microscopical, even serial sections, ever could.

In the horizontal meridian, the strands of the pectinate are a little dif-

ferent. The upper row, forming the suspensory ligament of the iris, is made of well-developed, white projections, lying almost horizontally above the cleft (fig. 10, PL). Below them there is the same network of strongly pigmented, thin, spongelike meshwork, but the cavity of the sinus is perhaps a little larger.

Many mistaken ideas have been entertained in regard to the so-called spaces of Fontana. Rochon-Duvigneaud[18] believed that in the pig the large opening between the upper and intermediate fibers of the pectinate ligament form a separte canal, larger than the spaces below. As seen in figures 9 and 10, this opinion is now untenable, the spaces are larger or smaller according to the plane of the sections, but no special canal is to be found.

In addition to the suspensory ligament of the iris and the spongelike fibers, there is in the sinus a third set of strong white-gray, longitudinal fibers which forms a triangular bundle with its base downward (fig. 9, M, T). This bundle separates the outer wall of the sinus from the sclera and runs from the insertion of the ciliary body below upward to the edge of the corneal slant at the level of the iris. This is the ciliary muscle and its tendon. We shall deal with it further.

The iris appears in the section as a thin, fibrous membrane with gaping vessels. At its root it curves downward, forming a square shoulder which becomes continuous with the detached portion of the ciliary body (DC, fig. 9). This curves to form the cavity in which the spongy tissue is contained. Below the sinus, the ciliary body, AC, becomes attached to the scleral wall, which at this point presents a thickening similar to the scleral spur in man.

Dissection: To obtain a better idea of the structures, the eye is placed on the special stand (fig. 3) and conveniently fastened with pins. The iris is pulled downward and inward (fig. 10). The fibers of the pectinate are stretched, and their direction, course, and insertion can be easily studied. The upper ones form a row of stout teeth which are inserted into the sclera at the edge of Descemet's membrane in an almost horizontal direction.

The traction continuing, the teeth give way and the angle gapes, showing on the external side the scleral wall slightly concave and on the inner side the sinus still attached to the ciliary body. However, the sinus has not been opened, but remains covered with a delicate membrane (N, fig. 10), which lines its external wall. This membrane appears as an independent structure, but is probably a simple condensation of the fibers of the tendon, T. It is made of a meshwork tissue and can be excised in part with scissors and examined flat upon a colored surface under high magnification, whereby its delicate framework can be readily recognized.

Inside the sinus, S, the fibers of the spongy tissue lose their geometrical arrangement.

The third set of fibers, the ciliary muscle and tendon, can be easily identified. They form a compact-looking, triangular bundle (M, fig. 10), which ends in two pointed tips, AC and T. The lower one, AC, separates the attached portion of the ciliary body from the sclera and is in continuation downward with the choroid. Its fibers are not simply in apposition with this membrane from U, the end of the suprachoroidal space, to T, as the microscopical examination alone may suggest, but are firmly anchored to the sclera. This anchorage is really the principal insertion of the ciliary muscle. (As we shall see later, the tendon of the ciliary muscle in man also has its principal attachment to the scleral spur.) The other pointed tip, T, runs like a wedge between the external wall of the sinus and the sclera and becomes attached upward to the corneal stroma and the end of Descemet's membrane. Like the lining membrane, N, it has a fenestrated structure (cribriform ligament) and has been considered the principal tendon of the ciliary muscle. It looks different from the lining membrane, N, but they are probably only split asunder. The relative importance of the lower scleral insertion, UT, and the upper one at the termination of Descemet's membrane can be easily ascertained: first, by in-

serting a dissecting needle into the suprachoroidal space and following it upward till it stops at the attachment of the ciliary body to the sclera, and second, by completely tearing the sinus to its apex.

In the horizontal meridian of the eye, dissection shows a condensation of the sclera, a spur to which the ciliary body is attached. If the traction continues, even this attachment gives way, and the two walls become widely separated.

The scleral wall is covered with patches of pigment throughout the whole length of the sinus and then becomes white. No vascular apertures are visible in the sclera under this magnification.

3. SHEEP.

Gonioscopy: The iris has a light-yellow color and shows the ordinary contraction furrows. The pupil is oval, horizontally elongated, and has in the middle of its border, above and below, a dark-brown elevation encroaching upon the margin and rising high above the surface of the iris, the "corpus nigrum." It is considerably larger on the upper than on the lower pupillary edge.

At the angle, the pectinate ligament has a peculiar aspect. It is made of white teeth, very broad, closely packed together, and sprinkled with dots of pigment. They are much stouter than in the pig or rabbit (fig. 11, PL). Some of them are prismatic, others conical with base downward, and yet others have irregular shapes. They stand obliquely, bridging the cleft with their tips raised at their upper attachment to the sclera. In some animals, and especially near the vertical meridian, the teeth coalesce, forming large membranes attached by their edge to the sclera and having few rounded spaces between them (fig. 11 bis).

Above the pectinate, there is a band of brown pigment streaks, branching irregularly. Farther away, the lower part of the corneal dome and the optical section of the cornea appear.

Microanatomy: The section of the angle is one of the most magnificent that can be seen with the slitlamp microscope because of its color and the richness of details under high magnifications (×30).

(1) *Corneo-scleral junction.* The cornea is thick and of equal breadth throughout. The sclero-corneal junction looks different in the vertical and horizontal meridians, due to the markedly oval shape of the cornea, the vertical diameter being in some cases shorter than the horizontal by more than 3 mm. In the vertical meridian, the corneal slant (C, fig. 12) is long, its angle very acute. Its base begins at the insertion of the conjunctiva and its apex ends at the level of the upper strands of the pectinate. At the tip of the scleral slant, at B, there is a marked circumcorneal pigment ring which is seen by translucency through the conjunctival attachment. Between the cornea and the sclera there is also a large amount of pigment that is especially thick near the lower border of the cornea at A. The line of the junction of the two membranes between A and B is often iridescent. In the horizontal meridian the junction is entirely different (fig. 11). The cornea meets the sclera in an almost straight, horizontal line, at the level of the pectinate. Transparent projections of the cornea interlace, like locked fingers, with others of the sclera, whose wavy, white fibers reach high into the corneal lamellae. Between the projections there are numerous, reddish-brown lines of pigment, J. The junction is not, however, a straight line. By transillumination the sclera is seen to rise a little in the middle. Below the conjunctival insertion lies the circumcorneal pigment ring, OR, which, followed from the edge of the front of the section, corresponds to the pigmented band seen with the gonioscope. In both meridians Descemet's membrane is clearly apparent. It is thick, of a beautiful light-blue color, and runs down to the upper teeth of the pectinate where it ends abruptly.

(2) *Cilio-scleral sinus.* This is also different in the vertical and horizontal meridians. In the former it is very large and deep (fig. 12) while in the horizontal it is small and quite narrow (fig. 11). The teeth of the pectinate in the vertical direction are of three kinds:

(a) The upper ones are strong, conical teeth white in color and covered with dots of pigment disposed in two or three rows. They bridge the cleft in a slightly oblique direction, with their tips crowded together at the scleral attachment, while their bases separate in a fanlike manner and become attached to the root of the iris and upper part of the ciliary body. This group of powerful strands corresponds to the suspensory ligament of the iris. In some parts of the angle the frontal examination shows that the upper teeth are fused together over a great extent, leaving only small, round apertures well separated from one another, T. At such spots the edge of the iris appears to be directly attached to the cornea by a whitish membrane (fig. 11 bis).

Below the upper teeth, there is a second set of fine, delicate fibers (E, fig. 12), which fill the cavity of the wide sinus. They run for the most part in a horizontal direction but interlace freely, forming a meshwork which, as in the pig, has a spongelike appearance. The fibers are covered with a great amount of pigment and the interspaces are almost black. Still lower and filling the bottom of the sinus, the meshwork is denser, nonpigmented, and its delicate fibers crisscross and interlace leaving smaller intermediary spaces.

A third set of strands runs in a longitudinal direction outside of the sinus and parallel to the scleral wall (fig. 12, T, N, and fig. 13, T). It has a triangular shape and appears to be made of long, white, delicate fibers, its base continuous with the posterior or attached part of the ciliary body, the cribriform ligament (M, fig. 12). The apex is inserted into Descemet's member and the tip of the corneal slant.

The iris bends at its root at right angles and is inserted into the ciliary body by a broad shoulder. The detached portion of the ciliary body, DC, is thick above and carries strong, deeply folded, processes. Downward, at the apex of the sinus it becomes narrow and is continuous with the attached ciliary body, AC. This contains the fibers of the ciliary muscle, M, which, arising in the choroid, end in a strong tendon, T.

Several large vessels cross the cavity of the sinus and the ciliary body (fig. 13). In the horizontal meridian (fig. 11) the strands of the pectinate are shorter and thicker. The sinus is narrow and contains a smaller amount of spongy tissue. The longitudinal fibers are less developed.

In the upper and lower borders of the iris near the vertical meridian, appear the so-called "corpora nigra" which are irregularly spherical, lobulated masses of the same brown color as the posterior layer of the iris. The upper one is much larger than the lower. According to T. Collins these masses interlock and divide the pupil into two narrow apertures.

The scleral wall becomes thicker at the level of the pectinate and then thins down at the posterior segment. No large vascular canals are visible in its substance.

Dissection: When the operator tries to tear out the iris with a forceps, a great resistance is felt. Then the teeth of the pectinate break loose from their scleral insertion, carrying with them the whole sinus (S, fig. 13). This is lined outside by the longitudinal bundle of fibers, N, the cribiform ligament, which appears as a thin, white membrane closing the detached sinus and giving insertion to the lower fibers of the pectinate. The blue Descemet's membrane is sometimes broken through and a small piece remains attached to the upper edge of the lining.

Upon separating the irido-ciliary body from the sclera with a piece of cotton of suitable size, it is possible to examine the thin membrane, N, from in front and determine that it is made of a network of delicate, interlacing, white strands, which run down to the bottom of the sinus. Between this membrane and the sclera stands out the triangular mass of the tendon, T. In the large eye of the sheep it can be easily distinguished from the lining membrane, N, while in the pig and rabbit it is much less developed. If a dissecting needle is run between the tendon and the sclera, it stops at U, where the muscle is firmly attached to the scleral wall. If the needle is inserted into the suprachoroi-

dal space and pushed forward, it stops at O, the end of the space. The mass of the muscle, M, however, cannot be separated from the sclera unless strong force is exerted with the needle, forward, or a forceps is used to grasp and tear the bulk of the muscle from O to U.

4. OX.

The disposition, aspect, and arrangement of the structures of the angle in the eye of cattle, as seen by microanatomy, are entirely similar to those found in the sheep. For this reason a separate description is unnecessary.

A Comparison of the Angle in Rodentia and Ungulata

The angles in Rodentia and Ungulata which, under the microscope seemed to be similar, show a marked difference under the slitlamp. In the former, the cilio-scleral sinus appears to be empty, while in Ungulata it is filled entirely with spongy tissue. The fibers of the latter had been seen, of course, with the microscope, but the perception of depth under the slitlamp microscope gives to this structure a quite different aspect. The sinus is really a prolongation of the anterior chamber and is filled with aqueous, which thus comes in contact at one side with the numerous vessels and capillaries of the ciliary body, and on the other with the intrascleral venous plexus (see page 492).

The size and depth of the sinus are probably in relation to the amount of aqueous contained in the anterior chamber and eliminated through the vessels.

What the physiological purpose of the spongy tissue is, it is difficult to decide at present. As there are no vessels in its fibers, its role is not to increase the surface of absorption. It is probable that the narrow meshes between the fibers permit aqueous to be soaked up by capillary attraction, sponge-like, and thus aid in the circulation of fluid from the chamber into the sinus. This capillary attraction would be particularly valuable in large eyes with a great amount of aqueous.

Regarding the ciliary muscle and its tendon, the method of dissection we have used has brought to light new facts that a lateral examination alone could not have disclosed. The separation and dislocation of the structures with the needle and forceps have proved that the fibers of the muscle and its tendon, which run parallel to the sclera, are not simply in apposition with it, but are attached to the scleral wall from the end of the suprachoroidal space to a point approximating, or a little higher than, the bottom of the sinus (O to T, fig. 7; O to T fig. 10; O to U, fig. 13). This lateral insertion serves as a permanent support for the zonula and the enormous spherical lens.

III. CARNIVORA

5. DOG.

Gonioscopy: The iris, dilated by the anesthetic, has a smooth surface. No contraction folds are visible (fig. 14). It is yellowish in color and brilliant, covered with round dots of brown pigment near the pupil and especially at the ciliary border, where they are denser.

The aspect of the pectinate ligament in Carnivora is entirely different as to the arrangement of the fibers. The comblike appearance so characteristic in the angle of Herbivora is replaced by a large number of meridionally disposed, thinner fibers. These show with the gonioscope a very beautiful design, resembling the trees of a forest (PL, fig. 14) with the wide conical or interlacing bases attached to the iris margin and a band of brown foliage at the top, spread upon a purple background. From the roots one or more trunks go up, singly or in anastomosis with others, and after bridging the cleft between the iris and the sclera, divide near its terminus into one or two branches, which become attached to the sclera underneath or to a narrow band of dark-brown dots of pigment, the inner or superficial pigment band, IP.

The fibers of the pectinate are very stout in the anterior planes, but in the deeper ones they become thinner. The superficial ones are colored brown and dotted with pigment. The spaces between the strands are the so-called "spaces of Fontana," and through them

the bluish-white coloration of the scleral wall is easily discernible.

The inner band of pigment, IP, into which the fibers are inserted, is made of dark brown, almost black, massed dots of pigment, with a wavy margin upwards. Its width is variable, its lower margin irregular in outline and somewhat indistinct (fig. 14). Beyond, there is a broad, purplish band, which appears to be deeper and presents a stippled or granular aspect, the outer pigment band, OP. Its width is about twice that of the inner band and made up of reddish-brown dots of pigment. The upper margin is separated from the reddish-white sclera above by a clear-cut border which is a little below the attachment of the conjunctiva (at C, fig. 16). As the outer pigment band is seen by transparency, the light from the gonioscope gives it a violet-red or purplish coloration. The sclera has a red color and shows several fine vessels, some parallel to the pigmented bands and the corneo-scleral junction, others rather oblique.

The aspects of the angle changes markedly in light-coated dogs. As seen in figure 15, the iris is less pigmented and the fibers of the pectinate ligament, PL, much lighter. The scleral wall behind them instead of being blue-white has a light-brown color. On the other hand, the inner pigment band, IP, has a dark-brown almost black color, and its innermost edge appears as if frayed. The outer pigment band, OP, instead of being purplish has a marked dark-blue hue. In white dogs, this band may even entirely disappear, due to the lack of pigment at the corneo-scleral junction (see page 488). No vessels are present in the sclera, which has only a reddish coloration.

Microanatomy: The angle when seen with the biomicroscope from in front, at a magnification of ×30, presents a most beautiful picture of the structures (fig. 16). The surface of the iris is smooth, no contraction furrows being apparent. In order to see clearly the pectinate ligament, the iris should be depressed by pulling with a forceps or pressing with a probe. The fibers then appear to be arranged in a meridional direction and very strikingly like the trees in a forest. They can be studied from the roots, which spring from the iris border and extend upward to insert their tops into the cornea, just at the end of Descemet's membrane (PL, fig. 16, and S, fig. 17). There are many layers of fibers at different depths, the superficial ones being stouter and brown in color, branching upwards and ending in a mass of brown foilage, IP. Some of the firmer twigs appear brilliantly white in the reflected light. Behind the strong, rounded trunks, the "suspensory ligament of the iris," there are many deeper, thinner, white fibers, in numerous rows. The trunks are attached upward and at different levels to the scleral wall in the middle, or to numerous round, superficial dots of pigment, the inner pigment band, IP. Below they are attached to the edge of the iris by solid and branched roots, some conical in shape, some forked or interlacing.

Following the angle structures to the edge of the specimen, it is easy to discover the cause of both bands of pigment. The inner one, IP, is made up of superficial dots of pigment, A, deposited partly on the surface of the cornea and partly in a deeper plane at the tip of the corneal slant, the latter being seen by transparency.

After death and hardening, the cornea becoming turbid, the outer band of pigment, OP, is not so striking in color nor so sharply demarcated as it appears to be with the gonioscope. This band corresponds to the pigment deposited between the cornea and the sclera: intrajunctional pigment, B, which being at a greater depth is seen through the whole thickness of the cornea.

(1) *The sclero-corneal union* is made in a long slant in the vertical meridian (fig. 16). The blue coloration of the cornea can be followed up to the lower part of the inner pigment band, A, where the superficial joins the deep pigment. The sclera is much thicker than the cornea and juts forward in a triangular wedge whose apex reaches a little above the outer pigment band, OR, where the conjunctiva is attached.

The base of the scleral wedge ends in a prominence at K. In white or light-coated dogs, there is little or no intrajunctional pigment. The pigmentation is limited to the surface of the cornea at A (fig. 16) and is more discrete than that represented in figure 14.

The thick sclera contains the numerous (three or four) large vascular apertures of Hovius's plexus, which runs at a level with the middle of the sinus cavity and below it. In the horizontal meridian the sclero-corneal junction is different. The structures meet slightly on the oblique (fig. 17), and are separated by straight lines of pigment with irregular prolongations toward the sclera.

(2) *The cilio-scleral sinus*, as seen in the section (S, fig. 16), gives a clear idea of the breadth and depth of the cleft and of the number and disposition of the fibers of the pectinate. In the dog, this sinus is very deep and communicates freely with the anterior chamber. Its capacity is increased by a depression in the outer or scleral wall below the projection, K. The inner wall is made by the iris root and the strip of ciliary body, DC. The cleft is filled with a close network of the fibers of the pectinate ligament. As has been said, the upper one or two are made of stout, superficial, pigmented trabeculae PL. Below them there are rows upon rows of white, very fine and delicate, meridional fibrils which are entirely different in aspect and arrangement from the spongy tissue in Ungulata. They are spread in a fanlike disposition from the surface of the inner pigment band, where the apices of the fibers are inserted to the outer surface of the detached ciliary body, DC. The innermost fibrils have an oblique direction and interweave freely with each other. The outer ones (N, fig. 17) are compact-looking, longitudinal fibers and follow a straight course, parallel to the sclera, forming a third separate bundle. This is anchored upward to the end of Descemet's membrane and the tip of the corneal slant, while downward it becomes wider and merges with the beginning of the muscle, M. This longitudinal bundle is analogous to the one found in rodents and Ungulata. In the dog, it has been considered similar in structure to the sclero-corneal trabeculum in man and to act as the tendon of the ciliary muscle. All fibers are sprinkled with specks of brown pigment.

The ciliary body is made of two sections, the upper one is the strip of tissue (DC, fig. 16) already described, while the lower is wider and forms a triangle whose apex is pointed back toward the choroid. The upper, or detached, portion, DC, is thin and of a light-brown color sprinkled with dots of pigment. Its structure is entirely different from that of the iris and cannot be considered, as some authors assume, to be a continuation of the former membrane.

The attached part of the ciliary body, AC, containing the muscle M (fig. 17), appears to be inserted into the sclera up to the end of the suprachoroidal space. Its surface presents a fibrillar aspect and is also sprinkled with dots of pigment.

In figure 16 the section passed through a valley between two ciliary processes. These appear at a deeper level and are very large, triangular masses, which reach far inwards, below the iris.

Dissection: Upon stretching the iris with a forceps, the pectinate fibers show very clearly their attachment, the upper insertion into the scleral wall on the inner superficial pigmented band and the lower one into the iris edge and down to the outer face of the detached part of the ciliary body. The trabeculae are so stout that it is difficult to tear them. They give way at the scleral insertion and cling to the iris root and ciliary body. If the traction continues, the fibers are split into two parts and the sinus opens and gapes. This behavior is different from that in Herbivora, where tearing keeps the sinus of the angle closed and merely separates it from the scleral wall.

The longitudinal bundle, N, stays in place along the sclera. To determine its real insertions, a dissecting needle is run, first into the suprachoroidal space until it stops at O (fig. 17), then is withdrawn and introduced between the bun-

dle, N, and the sclera at the middle of its course, and gently moved up and down. There is no attachment of the fibers to the sclera at that point, but the needle will stop above at the level of the corneo-scleral junction; if forced, the strands will be torn from their insertion carrying a splinter of the glassy Descemet's membrane (D, fig. 18). If moved downward, the needle will stop at U, showing that the muscle is attached to the sclera from O to U (fig. 17). This corresponds to the scleral spur in man and to the lateral attachment in Ungulata. It is probably the principal insertion of the muscle, the longitudinal bundle being only a retaining ligament to keep the traction of the muscle in line.

To uncover the scleral wall it is necessary to seize the ciliary body with forceps and detach it entirely (fig. 18). The membrane then shows its white surface at the site of the sinus, while above, the inner pigment band, and below, a great deposit of pigment dots give it a brown coloration.

6. CAT.

Gonioscopy: The angle of the cat is still more beautiful to look at than that of the dog. The arrangement of the pectinate fibers is very similar to the latter, but the distribution of the pigment quite different.

In the anesthetized animal the pupil is round and the iris narrow. It was yellowish in the dark-coated animal represented in figure 19. Contraction folds and furrows running in various directions (not represented in the figure) are apparent on the surface. The pectinate fibers, PL, are of a light golden color and run from the edge of the iris to a very black pigmented band on the sclera, IP. The upper row of fibers are similar to those found in the dog, but longer and finer. They are inserted into the iris by single, forked, or multiple roots and then rise, bridging the cleft of the anterior chamber to anchor themselves to the sclera at different levels in the inner pigmented band, IP.

In the background there are two different-colored zones separated by a lighter band. The inner one, A, behind the fibers has a dark-brownish hue and a granular aspect, while the outer is almost black and continuous, IP. Its upper margin has a very irregular, curved outline, clearly demarcated from a white, narrow, scleral band, Sc, which corresponds to the corneal insertion outward. Above this black band there sometimes appears at certain places, a stippled area, darker blue in color (not represented in figure 19, but seen in figure 20, OP) similar to the outer pigmented band of the dog.

Microanatomy. The cornea is thinner than in the dog; the anterior chamber very deep. The sclero-corneal junction in the vertical meridian is similar to that in the dog, the cornea having a very long slant, coming down to the level of the iris (fig. 20). The eye from which this section was made was different from the one used for gonioscopy. The former, belonging to a light-coated animal, shows a much lighter, brownish, inner pigment band, IP, at the top of the pectinate fibers. The intrajunctional pigment is deposited in thin lines of brown dots in two groups. The inner one, A, lies in the cornea itself and the outer, B, between both membranes. At variance with that of the dog, the intrajunctional pigment usually has its upper edge at the same level or at a lower level than the inner pigment band; hence, when observed with the gonioscope it only reinforces the dark coloration of the inner pigment band, A. But, at certain places the intrajunctional pigment reaches farther upward (OP, fig. 20), and then is seen through the cornea as a bluish or brownish limited area above the inner band.

At the edge of the section the cilioscleral sinus appears as a deep crevice between the iris root and ciliary body on one side and sclera on the other. This sinus communicates freely with the anterior chamber. The outer or scleral wall increases in thickness from the corneo-scleral slant to about the middle of the sinus and then becomes thinner again at the level of the ciliary muscle. Numerous, large vessels are found in the substance of the sclera, corresponding to Hovius's plexus in the

dog. In figures 20 and 21, four or five can be seen. In some sections, other small vessels can be observed at the inner surface of the sclera, filling small notches on the edge of the membrane, between it and a longitudinal bundle of fibers, N.

The cavity of the sinus (S, fig. 20) is filled entirely with fine, meridional, white fibers, which are clearly divided into three sets. In the first two, the strands are arranged fan-like, the apex being inserted above into the cornea at various levels. Then they course downward, bridging the gap and attaching themselves to the ciliary wall. As in the dog, the first or upper set of fibers is stouter and pigmented. It deserves the name of "suspensory ligament of the iris," because when divided the iris root and strip of ciliary body fall down from the wall. The fibers of the second set below the upper ones are then seen to be white and sprinkled with brilliant yellow dots which give them the aspect of a gossamer veil covered with spangles. The third set forms a longitudinal bundle of thin filaments, parallel to the sclera and triangular in shape, the narrow base merging with the muscle in the attached part of the ciliary body. The detached and attached portions of the ciliary body are similar to those in the dog. The processes are somewhat different, more rounded, and do not advance so far inward, although they also are in contact with the posterior surface of the iris.

Dissection: Upon pulling away the iris by the root, the disposition and both insertions of the fibers can be easily studied. If the stretching continues, the strands of the pectinate break up at the scleral insertion, contract, and cling to the iris and ciliary wall. Then the sinus is open and gapes. The longitudinal bundle of the tendon, N, is not disturbed. To detect its insertions, a dissecting needle is passed along the middle of its course and gently moved up and down. There is no resistance, for the bundle is only in apposition with the sclera. The needle falls progressively into the notches containing vessels at the edge of the sclera. If the needle is carried upward it stops near the corneo-scleral junction and if forced detaches the tendon, N, from the end of Descemet's membrane and nearby corneal lamellae. Moved downward, it stops near the base of the tendon at the point U (fig. 21). Thence to the end of the suprachoroidal space, O, the ciliary body is strongly attached to the sclera. Finally, if the ciliary body is grasped with a forceps and detached (fig. 21), the tendon remains inserted at its base, U, while numerous fibers, N, N′, still remain attached to both walls.

The sclera appears to be pigmented throughout the extent of the sinus. Beyond, it has its normal white color.

A Comparison of the Angle Structures of Ungulata and Carnivora

In Ungulata the arrangement of the upper row of strands of the pectinate or suspensory ligament of the iris is distinctive. They are stout, conical fibers which arise from the iris and run in an almost horizontal direction. They may be aptly compared to the girders of a common bridge, spanning the cilioscleral cleft horizontally (fig. 33, A). In Carnivora the suspensory ligament of the iris has an entirely different course. It runs rather vertically from the border of the cornea down to the iris surface in long, thin, delicate, pigmented fibers, which suspend the iris like the cables of a suspension bridge (fig. 33, B).

Below the suspensory ligament there is a second kind of filament which is also different in Herbivora and Carnivora. In the former, the deeper rows are made of much thinner, delicate fibers which, in the upper part of the sinus, interlace freely, closely resembling a spongey mass and then become white and more compact, while in Carnivora the fibers are thin strands all of which run in a definite direction and have a fanlike course from the corneal edge to the outer wall of the ciliary body.

The third group of fibers is, however, alike in both orders. It is made of a triangular meshwork of filaments parallel to the scleral wall, its base along the attached portion of the ciliary body and its apex inserted into the corneal lamellae and the end of Descemet's membrane.

What the physiological purpose of the fibers is, which fill the cilio-scleral sinus in Carnivora, it is difficult to explain at present. Undoubtedly such a deep recess in free communication with the anterior chamber and bordered on each side by tissues containing numerous vessels, has an important role in the outflow of the aqueous, but the function of the numerous thin fibers entirely filling it does not seem to be the absorption of fluid, although the spaces between the moving filaments may exert some capillary attraction upon the aqueous; this, however, can not be so great as in the fixed meshes of the spongy tissue in Ungulata. It is far more likely that, as Henderson believes, these fibers play some role in the accommodation which in Carnivora is more developed than in Ungulata. Their fanlike arrangement provides a firm support for the detached part of the ciliary body and through this, in part, for the large, spherical lens.

The anterior chamber in lower Mammalia is very large in comparison to that of man. According to T. Collins,[15] the cornea increases in size relatively to the size of the eyeball with an optical purpose in view: to allow rays of light of great obliquity to be refracted and penetrate the eyeball, increasing the field of vision and giving clearness to peripheral images. Large corneas are usually associated with large, almost spherical lenses. This is very important to the obtaining of large monocular fields of vision, which are used especially to detect moving objects by animals which do not possess a differentiated macula. The increase in the radius of curvature of the cornea brings about a greater capacity of the anterior chamber, with a corresponding need for larger surfaces of absorption of the aqueous; hence the deep cilio-scleral sinus.

The ciliary muscle and its tendon: The structure, development, and connection of the ciliary muscle have been the subject of considerable research in an endeavor to ascertain the amount and type of accommodation in different zoological orders.

According to T. Collins, the ciliary muscle is practically nonexistent in lower mammals, such as echidna and the great anteater. In rabbits, only a few scanty fibers are recognizable. In Marsupials there is a small definite bundle of longitudinally placed muscular strands. In Ungulata and Carnivora, the longitudinal fibers are more numerous and form a considerably broader band.

With the slitlamp the arrangement and direction of the muscular fibers can be seen, to a certain extent, in higher mammals, such as Carnivora and Primates, but larger magnifications and differentiation, which only the microscope can give, are necessary for a complete study in all cases.

In regard to the tendon, considerable confusion and misunderstanding still exists, but here the methods of microdissection help a great deal to determine the exact insertion of the muscle and the nature and course of its tendon.

The common belief is that in Herbivora the tendon is a continuation of the meridional fibers of the muscle and has its forward insertion at the end of Descemet's membrane and nearby corneal tissue. According to T. Henderson,[5] the fixed point of origin of the ciliary muscle, "not merely in Herbivora but throughout Mammalia," is a structure which from its regular sievelike formation he has called "cribriform ligament." This he represents in his pictures as a triangular meshwork acting as a tendon whose base is connected with the muscle and whose tip is attached to about the middle of the outer wall of the sinus.

He further adds: "We have in the angle of the Herbivora two definite and distinct structures: firstly, the series of stout bands known as the pectinate ligament, which holds the iris and the ciliary region in position; and secondly, on the 'inner side of Schlemm's canal,' the fine open network of the cribriform ligament, which rises from the inner lamellae of the cornea and acts as the ligament of origin of the ciliary muscle."

We will consider later the statement that the cribriform ligament is "on the

inner side of Schlemm's canal," as in Herbivora or Carnivora there is no Schlemm's canal to speak of. Henderson explains the difference between the anatomic arrangement of the pectinate in both genera simply by the requirements of accommodation. He believes that the stout fibers of the pectinate in Herbivora are there to give a strong support to the fibrous base of the ciliary processes (the detached portion of the ciliary body), which is intended to withstand the zonular traction they have to support. In Carnivora he believes that muscle has replaced the fibrous base as a supporting medium and there is no necessity for the strong attaching bands of the pectinate. The delicate fibers filling the sinus he sees only as tendons of this forward prolongation of the ciliary body, inserting themselves with the cribriform ligament into the cornea.

As we have seen, it is easy to demonstrate by microdissection the bundle of fibers making up the ciliary muscle and tendon (T, figs. 10, 13, and N, figs. 17, 21), and to find that they are not simply in apposition with the sclera, as it is commonly supposed, but strongly attached to this membrane from the end of the suprachoroidal space, O, to a point forward, U, at some distance from the apex of the sinus. This is really the point of origin of the ciliary muscle, where the fibers have a strong lateral attachment, as they do at the scleral spur in man. The fenestrated or cribriform bundle, due to its weaker texture, is most probably a prolongation, a check ligament of the muscle, which gives to its fibers a secondary elastic insertion and keeps the line of contraction in a meridional direction. This mechanism is alike in Herbivora and Carnivora, depending on the amount of muscular fibers existing in each animal.

Intrascleral venous plexus (Schlemm's venous plexus): In the substance of the sclera there is a very large, circular network of vessels, which in the dog and cat are of large caliber and can be easily recognized with the slitlamp, while in Herbivora they are not visible under this magnification. However, microscopic examination has shown that they exist also in the latter animals. In the dog the network is very deep in the sclera and can be detected in the living eye (Hovius's plexus). With the slitlamp it is visible even to its smaller branches, near the inner surface of the sclera (H, fig. 17). It extends in a circular band from the level of the iris upwards, to about the middle or end of the ciliary body downward.

The microscope has shown that the meshes of the plexus are very narrow in Carnivora, while in Herbivora they are wider. According to Kalt,[19] in the latter the plexus can be seen clearly only after the vessels have been injected and the numerous pigment cells that lie around them have been decolorized.

The trabeculae: Some authors (Kubik, Davis) taking human structures as a guide, compare the longitudinal or cribriform bundle of the tendon in animals to the "trabeculum sclerocorneale" in man. They also call "uveal trabeculum" the teeth of the pectinate which arise from and have the same histological elements as the iris stroma.

This assimilation is made from the histological and especially from the physiological standpoint, as the cilioscleral sinus and the vessels of the intrascleral plexus are supposed to be similar to Schlemm's canal. As we will show later this last assumption is not tenable. We consider that there is no advantage (and it will be confusing) in applying the names of structures in man to those in animals which are far different and suited to different functions.

Part II will appear in the next issue.

CHRONIC POSTOPERATIVE OR POSTTRAUMATIC RETINITIS (RETINITIS SEROSA)

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The author reviews briefly the so-called iritis serosa, then proceeds to the main theme, describing an identical and parallel disease in the retina which is called retinitis serosa. The two diseases are independent of each other. Discussion is restricted to injured eyes in which the lens has been greatly damaged. The cause of the lesion in iris and retina is attributed to the action of irritating substances derived from free lens matter. Read before the American Ophthalmological Society at Hot Springs, Virginia, June 5, 6, 7, 1935.

Some cases of cataract extraction are deceptive in that one is led to believe that the eye is pursuing an uncomplicated course, until, at about the eighth or tenth day, an increase in ciliary injection and pain set in. A few days later deposits appear on Descemet's membrane. This reaction is remarkable in that it does not follow immediately after operation or injury, but only after a considerable interval has elapsed. This condition is nearly always associated with the presence in the anterior chamber of a large amount of lens matter which fails to undergo resorption. Such reaction is the bane of the surgeon in cases of immature senile cataract that are not extracted by the intracapsular method. Great chronicity characterizes the condition. Although the iris may have received but little or no injury, yet invariably it shows discoloration and swelling, which, under the microscope, are seen to be the result of a characteristic infiltration of lymphocytes and plasma cells. The precipitates are not the outstanding feature in this syndrome of what is commonly termed "iritis serosa," but in reality it is the infiltration in the stroma from which the precipitates are derived. The term iritis serosa has long been recognized as a misnomer because it implies that the exudate is of a clear, fluid nature, whereas it really is exceedingly cellular. E. Fuchs[1] described the changes in the iris accurately, and suggested the name of chronic infiltrating iritis for the process, inserting the word postoperative or posttraumatic as circumstances warranted. Verhoeff and Lemoine,[2] having regard for the role possibly played in the reaction by the absorption of proteins in individuals hypersensitive to lens proteins, gave the name endophthalmitis phakoanaphylactica to the inflammation. For the purpose of brevity the shorter and more familiar term iritis serosa will be employed here.

Neither Fuchs nor Verhoeff, in the histologic description of their material, give more than a cursory account of the reaction in the retina that accompanies iritis serosa. Eyes so affected are enucleated because of failing vision and for fear of ensuing sympathetic ophthalmia. In order to be fully informed as to the cause of the failing vision, which is the deciding factor in the question of enucleation, one should have in mind a picture of what may be taking place in the retina once the diagnosis of iritis serosa is made. This paper is concerned chiefly with the pathologic changes in the retina that go hand in hand with those in the iris.

Material

The material consisted of microscopic preparations from 59 globes, in all of which it had been possible to make a diagnosis of iritis serosa, with or without the presence of precipitates, prior to examining the retina. An inflammation in the retina, similar to that in the iris, designated here as "retinitis serosa" to conform to the term "iritis serosa," was invariably found.

Clinical aspects

1. Cause. So far as clinical data were available, in most instances the eyes of young persons were removed because of injury. In many cases the eyes of elderly persons, who are less exposed to injury, were removed after unsuccessful operations for cataract and

glaucoma. The subject assumes importance from a surgical standpoint.

2. Interval between traumatism and enucleation.

Time	Number
13 days	1
2 weeks	1
3 "	1
4 "	2
5 "	3
7 "	1
8 "	4
10 "	1
3 months	6
4 "	5
8 "	1
13 "	1
14 "	1
2 years	1
4 "	1
10 "	1
14 "	1
Unknown	27
Total	59

Pathologic anatomy

For a better understanding of the relationship that exists between the inflammation in the iris and that in the retina the following résumé of the findings in the anterior segment is given before the pathology of retinitis serosa is to be studied.

Cornea. In 22 cases deposits were found on Descemet's membrane and in other cases isolated cells were seen. In a number of instances there were no deposits; this does not exclude the possibility that deposits were sometimes present, but owing to the direction of the sections, they were missed. In a few cases no anterior chamber was present, so that there was no place for deposits to form.

Considering the large number of cases in which the lens was injured, the rarity of deposits of lens matter on Descemet's membrane was striking. The explanation is that probably, owing to the quick onset of inflammation after the injury, the lens matter was covered by exudate and compressed before it could be dissolved and dispered anteriorly. Strange to say, only once were pigment deposits found. In ordinary spontaneous iritis, pigment deposits are not an unusual feature, but in traumatic iritis, brownish or black deposits seem to be rare—which is an important point in the differential diagnosis between the two processes. The reason for this may be that in iritis serosa, because of the early fixation of the iris to the lens, due to the injury, the pigment is not easily carried forward.

Anterior chamber. Anterior peripheral adhesions were found in more than one half of the cases. At times they were so extensive that the iris on one side lay entirely on the posterior surface of the cornea. A really free filtration angle was seen in only five cases, and then there were lymphocytes and plasma cells in the pectinate ligament. In explanation of the adhesions it was believed that because of the perforations, the anterior chamber was eliminated and continued to be absent for a long time. In this way the swollen iris came in contact with the pectinate ligament and remained fixed.

Iris. So characteristic was the main feature of the condition in the iris, namely, an infiltration, that the description in almost every case bore the expression "packed with lymphocytes and plasma cells." Another feature was the presence of nodules of lymphocytes which, in the majority of cases, showed a predilection for the root. This is also a favorite site for the nodules of spontaneous and of sympathetic iritis. Only in a few instances were plasma cells missing.

Lens. The lens played a most important role in the pathologic picture. In 10 cases, operations for cataract had been preformed, and in all others the lens was seriously involved. In three patients the penetrating wound extended through the lens into the vitreous body. In 12 cases, portions of the lens were replaced by granulation tissue. Frequently, granulation tissue fixed the lens to the scar of the wound or to the iris.

The granulation tissue localized in the scar differed from the membranes seen in endophthalmitis septica. It often contained masses of lymphocytes and plasma cells, but no pus cells were present as in endophthalmitis septica. In iritis serosa the granulation tissue is circumscribed and compact, and is not

likely to reach the ciliary processes. It never extends upon the flat part of the ciliary body, whereas in endophthalmitis septica the flat part is the common site for the formation of membranes.

on the surface except along the flat part, where they might be somewhat abundant. Occasionally, a deposit was encountered on the outer surface of the muscle in cases in which the ciliary body was previously detached.

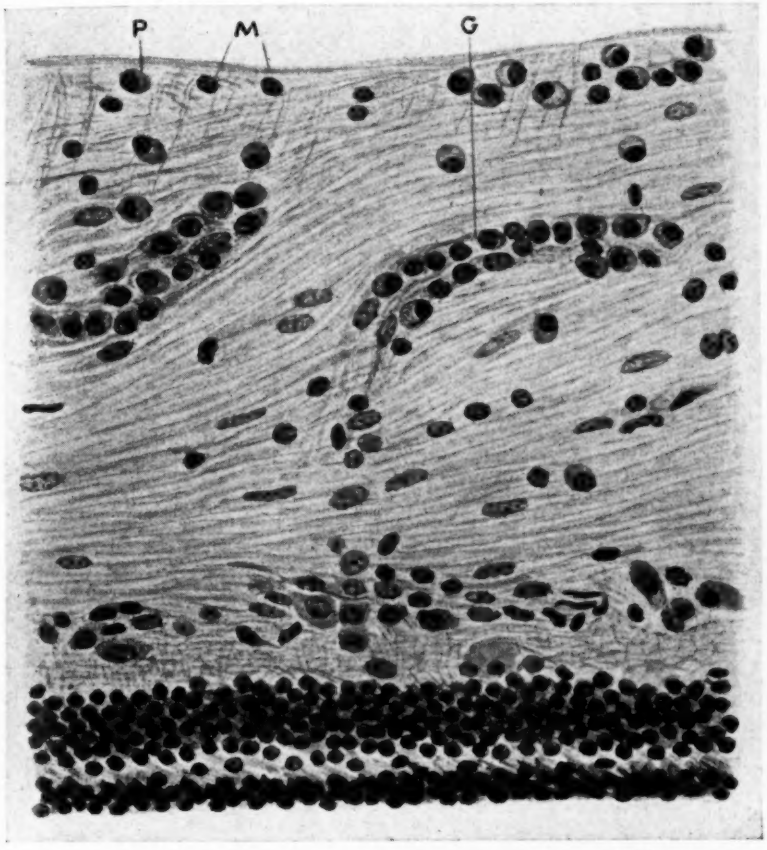

Fig. 1 (Samuels). Numerous characteristic plasma cells, P, are scattered all over the nerve-fiber layer. In two places the plasma cells form bands because they accompany capillaries, G. The nuclei of the plasma cells are in cells having a large amount of protoplasm, whereas the protoplasm of other mononuclear cells, M, is so scanty as not to be discernible in the drawing.

Ciliary body. Inflammation in the ciliary body was, as a rule, far less conspicuous than in the iris. The reason adduced for this had an anatomic basis. The iris is a very loose tissue, whereas the ciliary body is a coarse and compact one. Furthermore, the ciliary body is more prone to react by forming an exudation than it is to become merely infiltrated. Rarely were deposits present

Vitreous body. Frequently solitary cells were found in the vitreous stroma in the neighborhood of the ciliary body. In some cases deposits were located on the outer surface of the anterior limiting layer, the cells of which doubtless came from the ciliary body.

Retina. In the character of its inflammation the retina revealed a remarkable parallelism with the iris. This parallel-

ism was more pronounced than in the ciliary body, which showed no infiltration in eight cases, whereas only twice was the retina free from a diffuse infiltration.

The inflammatory phenomena encountered in the retina were as follows: near the posterior pole, although, in some cases, very numerous near the ora serrata.

Not infrequently the plasma cells displayed a particular arrangement of their own; that is, they were distributed along the capillaries. Apparently the

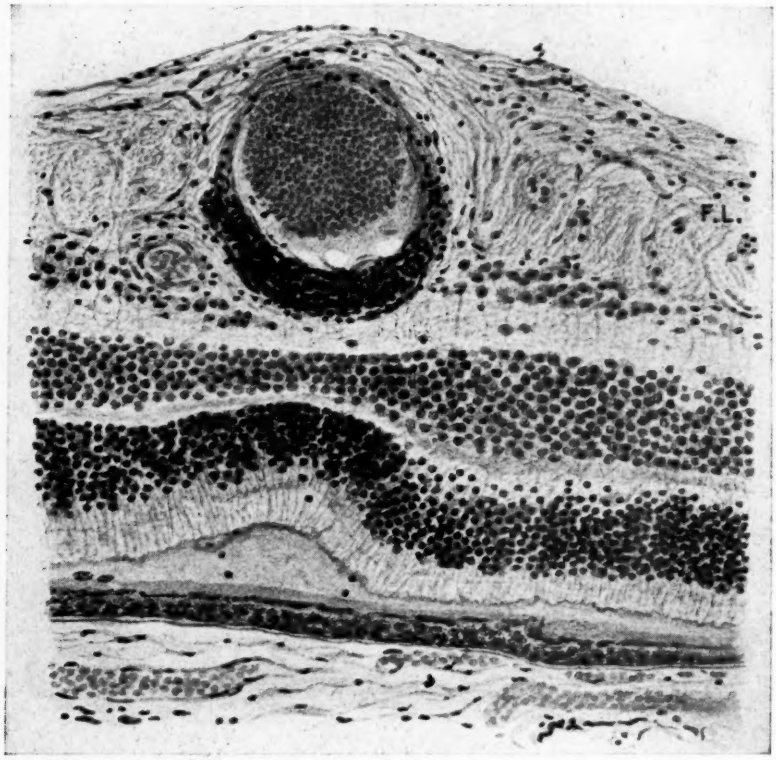

Fig. 2 (Samuels). The nerve-fiber layer, F.L., is infiltrated with a few lymphocytes and contains a vessel which elevates the inner surface of the retina. The vessel is filled with blood. The external wall is so much more heavily infiltrated than the internal wall as to give the infiltrating ring the shape of a crescent. There is a small fold on the outer surface of the retina in which an albuminous fluid and a few lymphocytes have accumulated.

1. Cellular Infiltration.—Lymphocytes and plasma cells were the types represented in the infiltration just as in the iris. Lymphocytes alone were found in 20 cases, and a combination of lymphocytes and plasma cells was found in all the others.

The infiltrating cells were for the most part disposed diffusely between the nerve fibers and the ganglion cells; not any were noted in the neuroepithelium. They were more numerous walls of the capillaries had produced them. That plasma cells may possess the power of locomotion was suggested by the fact that they were often traced in rows beneath the limitans interna, which they seemed to be unable to penetrate. Such rows were described and drawn for the first time in the Atlas of A. Fuchs.[3]

The retina is a tissue which, because of its feltlike texture, does not readily lend itself to diffuse infiltration, in-

asmuch as its elements run parallel or at right angles to the surface. Lymphocytes and plasma cells are said to be derived from connective tissue. The only tissue of this kind in the retina from which infiltrating cells may come is the walls of the blood vessels, which are separated from the retinal stroma by a lymph space. As a consequence, lymphocytes and plasma cells, in the form of perivascular tubes, tend to accumulate at the place of their origin.

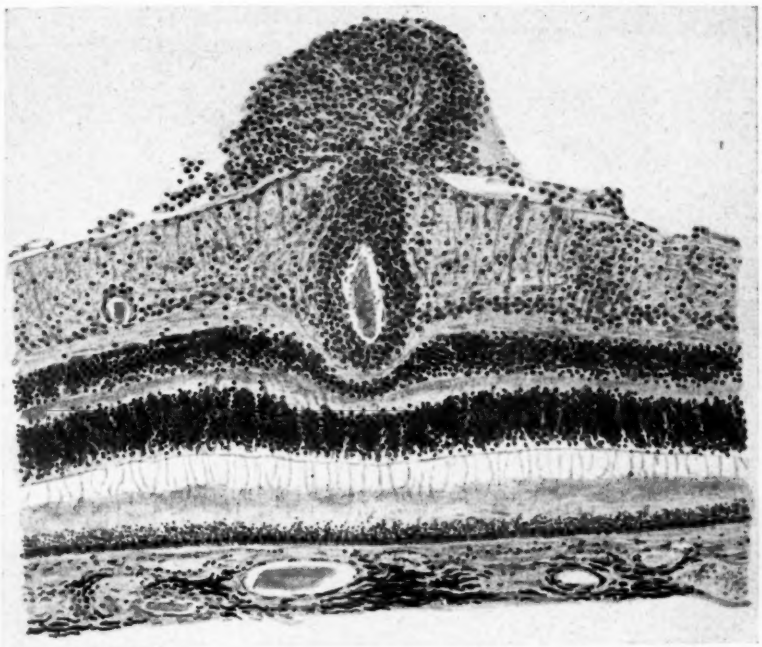

Fig. 3 (Samuels). A vessel in the nerve-fiber layer is surrounded by mononuclear cells from which a mushroom-shaped precipitate rises. A thin coating of cells extends along either side.

The fact that so great an abundance of plasma cells was found in this collection gives them a special significance, one almost pathognomonic for retinitis serosa.

2. Edema.—The common forms of retinitis produce edema, circumscribed accumulations of albuminous fluid, fatty degeneration, and pigmentation, besides changes of various kinds in the blood vessels. Some of these general changes accompanied the characteristic infiltration.

Edema was exhibited to a marked degree in a number of cases, but this does not imply that edema belongs to the essential and characteristic changes in retinitis serosa. The accumulation of fluid manifested itself in a peculiar manner by pressing the limitans interna away from the nerve-fiber layer in the shape of vesicles. An analogous detachment of the limitans occurs as a post-mortem change, but in the cases here recorded cells were frequently found in the vesicles which could have reached them only during life. Occasionally the space between the fiber layer and the separated limitans interna was traversed by exceedingly fine fibers which were considered to be neuroglia fibers that had been carried forward by the fluid. The processes of Müller's supporting fibers that bind the limitans interna to the nerve-fiber layer appeared to be sharply broken off at that moment of separation, or were later dissolved, so that often there was present a clear albuminous fluid.

In exceptional cases a general swelling of the retinal tissue was found. The accumulation of fluid in the macular region was remarkable at times. More than once the fovea was pushed inward in the form of a sharp fold behind which there was a fluid more highly albuminous than that under the detached limitans interna. The immediate neighborhood of the papilla was also a favorite site for edema and wrinkling of the retina.

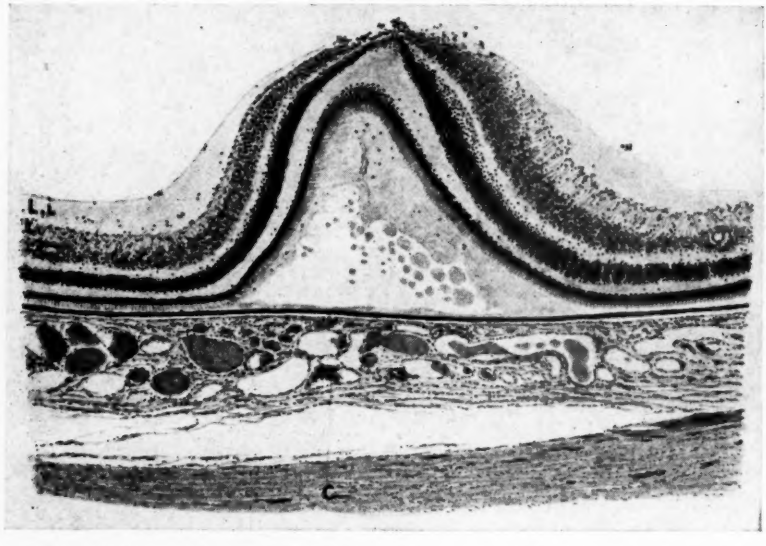

Fig. 4 (Samuels). The macular region is detached in the shape of a fold beneath which there is an accumulation of coagulated fluid. The retina shows a high degree of edema as is indicated by the separation of the limitans interna, L.i., by a fluid which is less albuminous than that under the fold. L, a few leukocytes; C, a small focus of lymphocytes in the choroid.

3. Perivasculitis.—Second in importance to the general infiltration in the retina was the infiltration localized about the blood vessels; this proved to be a distinguishing feature of retinitis serosa. In 21 cases it attained an astonishingly high degree, and in only five cases was it absent. It is true that perivasculitis is common in endophthalmitis, but it is different from the type found in retinitis serosa. In the former the infiltration is made up of polymorphonuclear leukocytes and disappears more quickly than does that in retinitis serosa. The cells that compose the perivasculitis of retinitis serosa are lymphocytes and, to a less extent, plasma cells. In the retina it is often difficult to decide whether the infiltrated vessels are arteries or veins, especially when the vessels are small and there is a dense infiltration of the walls. The blood vessels of the retina participated in the inflammation in the following ways:

First: In many instances the perivasculitis was seen nearly as far forward as the ora serrata.

Second: The perivasculitis was often irregularly distributed, being more marked and extending farther forward in some parts of the retina than in others. Certain branches of the vessels were infiltrated and others were not. At times the high degree which the perivasculitis reached was amazing. In some instances, the walls of the vessels were so thick as to elevate the inner surface of the retina and at the same time push aside the nuclear layers. Occasionally, in cross-section the infiltration assumed a signet-ring shape, the thicker border being on the side of the neuroepithelium, where the lymph space is

probably more easily dilated than on the side next to the limitans interna.

4. Deposits on the Retina.—In all but six cases an exudate was found on the inner surface of the retina. In 27 cases it assumed a spherical or mushroom shape. Such masses were referred to in our notes as "deposits" or "precipitates," although it was understood that they remained where they had been formed and did not represent cells set free in a fluid and afterward collected in the form of globules and then deposited on the surface, as are the precipitates deposited on Descemet's membrane.

visible to the naked eye. They were generally found in the posterior segment.

Manner of Development of the Deposits.—The deposits frequently lay over or in the immediate vicinity of the retinal vessels, suggesting the picture of endophthalmitis, with, however, a difference. In the latter condition pus cells migrate from the stream within the walls of the vessels, whereas in retinitis serosa the deposits are believed to develop from a proliferation of the cells that compose the walls.

Position of the Retina.—That the

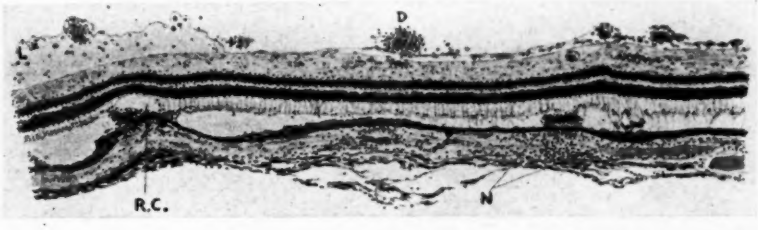

Fig. 5 (Samuels). The nerve-fiber layer of the retina is infiltrated and is sprinkled with deposits, D. To the left the limitans interna, L, is detached from the retina. In the space so formed a deposit lies. The choroid shows foci of lymphocytic infiltration. Between the pigment epithelium and the retina are nodules, N, of lymphocytes causing adhesions. To the left, the lymphocytes which came to the surface from the choroid have destroyed the pigment epithelium and rods and cones, R.C.

In a number of instances in which the vitreous was detached, deposits adhered to its posterior surface. Whether the deposits formed first on the surface of the retina and were then detached when the vitreous retracted or whether some of them collected on the vitreous after its detachment could not easily be decided. It was certain that the cells were very rarely able to penetrate the posterior limiting layer of the vitreous to form typical deposits on its inner surface. In one case the central area of a detached vitreous had undergone liquefaction and the posterior limiting layer had been converted into a homogeneous membrane on the outer and inner surfaces of which numerous deposits had collected. It was believed that the deposits on the inner surface were derived from the ciliary body in the usual way. At times the deposits on the retina were of gigantic size, being

retina was practically always *in situ* was one of the extraordinary revelations of this survey. In a study of 59 cases in which the eyes were enucleated because of complications that arose after operations or injuries, one would expect to find a number of detachments. These eyes were frequently spoken of in the histories as atrophic, and yet there were only three cases of total detachment, and in only three instances was there any forward traction of the retina. The cases of complete detachment were the direct result of severe wounds and were probably already present at the time the serious inflammation developed, which unlike common inflammation, requires several days. In 12 cases the retina was partially detached, but here too the impression was gained that the detachment was not the result of inflammation or of its products, such as exudates

or membranes, but was also the immediate consequence of injury.

In addition to infiltration, perivasculitis, and the formation of deposits it can be said that the continuance of the retina *in situ* is one of the outstanding features of retinitis serosa. If a detachment is not the result of injury, then one has no reason to suspect it in retinitis serosa.

The condition and position of the retina prove anew that there is a difference in intraocular connective tissues, and that this is dependent on their derivation. Membranes that develop from the organization of pus cells or blood produce, on the one hand, great traction, whereas those the result of mere irritation produce less traction.

Papilla. The papilla was almost invariably involved in the inflammation of the retina, which may have been one of the reasons for the reduction in vision. Two types of involvement were differentiated:

First: The Edematous Type.—The neuritic swelling was often so great as to push the retina aside, somewhat resembling a typical choked disc. In several cases an albuminous exudate was present in the internuclear layers adjacent to the papilla. The papilledema, which was marked in eight cases, may in some instances have been a sequel of hypotension from the escape of fluid through a perforating wound. That the papilledema was a part of the process of retinitis serosa was shown by perivasculitis and infiltration of lymphocytes and plasma cells among the nerve fibers.

Second: The Exudative Type.—In this type of involvement the edema was not so marked, but instead an exudate filled the pit or a membrane covered the surface, beneath which, among the nerve bundles, were lymphocytes and plasma cells together with perivasculitis.

Whereas on the surface of the retina the cells exhibited but little tendency to organize, the reverse occurred on the disc. There were many cases of organized exudate in the vessel funnel and of the formation of membranes on the surface. That the papilla manifests a tendency to act as an organizer of cells is not surprising when one considers that the large blood vessels are here.

In three cases of glaucoma in which the tissue within the excavation was atrophic, infiltration and perivasculitis were absent. Apparently, an atrophic nerve in glaucoma having been long under pressure, the vessel walls lose their cell-producing power.

Retinitis serosa combined with other processes

With so large a material it was reasonable to find a few extraordinary conditions, as, for instance:

1. Retinitis serosa combined with endophthalmitis septica. Of this complication there were three cases, but in every one the polynuclear cells were few in number as compared with the mononuclear cells. Iritis serosa and endophthalmitis septica are rarely combined, and, indeed, in these cases only one was a frank endophthalmitis with a vitreous abscess. In the other two the pus cells were isolated.

2. Retinitis serosa combined with sympathetic ophthalmia. When a severe iritis with deposits on Descemet's membrane sets in after an injury or an operation, the question arises as to the danger of the fellow eye becoming inflamed. It has been maintained that an eye with deposits on Descemet's membrane is not likely to cause sympathetic ophthalmia. The deposits are said to appear only in the sympathizing eye.

In the present series there were three cases in which the typical infiltration of sympathetic ophthalmia, namely, lymphocytes and epithelioid and giant cells, was found in the choroid, and at the same time there were deposits on the cornea and plasma cells in the iris and retina. All three cases gave a history of inflammation in the fellow eye. In three other cases typical sympathetic elements were present in the choroid, and yet the fellow eye was not said to have been involved. Probably these globes were removed before the inflammation had had time to spread.

The pathologic diagnosis between iritis serosa and sympathetic inflamma-

tion is not difficult. The only cellular element that the two conditions have in common are the lymphocytes. The presence of lymphocytes and plasma cells in the iris, and to a less extent in the ciliary body, and the fact that none is present in the choroid complete the diagnosis of what is known as iritis serosa. In sympathetic inflammation it is true that the main cells are lymphocytes, to which may be added epithelioid and giant cells, but the site of the predilection for this infiltration is the choroid and not the iris.

These six cases are of great importance, inasmuch as they prove that there may be exceptions to the rule that injured eyes with precipitates on Descemet's membrane are not dangerous to the fellow eye.

Concerning retinitis serosa in cases of spontaneous iritis serosa

The appearance of the iris and the presence of the precipitates are about the same in spontaneous iritis as in traumatic iritis. The history of an injury is the only certain method of differentiation clinically or pathologically.

The exact behavior of the retina in spontaneous iritis serosa is hard to follow with the microscope since only in old cases in which the globes have become atrophic and painful is enucleation performed, whereas the globes here studied were relatively recently inflamed and probably most of them were enucleated because of the danger of sympathetic ophthalmia.

General pathologic knowledge teaches that the main difference between traumatic and spontaneous iritis serosa lies in the behavior of the retina. In spontaneous iritis the abundant proliferation of plasma cells, the comparatively enormous perivasculitis, and the deposits upon the retina are not usually found. On the other hand, lymphocytic nodules in the choroid and a detached and degenerated retina are the fundamental findings. Frankly, we do not know what the retina shows in very early cases of spontaneous iritis, since this disease is too mild at the beginning to demand enucleation. Opacities in the vitreous and diffuse cloudiness of the retina suggest reaction in the retina, but this cannot be pronounced since the vision, as a rule, is good, whereas the traumatic form is characterized by poor vision.

Comparison of the reaction in the various tissues

The appended table affords a summary of the reaction not only of the retina, but of other tissues in the various inflammatory processes that have been mentioned.

A special case

So far in this inquiry the lesion in the retina has paralleled that in the iris, but in one instance there was an aniridia in a child five years of age. The entire iris was extruded at the moment of the injury, and the lens was severely damaged. The retina was more heavily infiltrated than in the average case.

Etiology of retinitis serosa

The incidence of inflammation in the iris and in the retina without corresponding involvement of the ciliary body leads to the deduction that the process is not transferred to the retina by continuity, but that it is a separate reaction in each structure. The origin of each process must be traced back to some sequela of the perforation. An impressive feature was that in most instances the wound had healed firmly, with properly coapted edges, so that irritation and infection from this source could be excluded. In relatively few cases was there any great damage to the iris or ciliary body from trauma. But the reverse was true as regards the lens, which was injured in practically every case and often to a great extent. This fact, connected with the usual appearance of iritis serosa eight or ten days after an injury, brings us to the conclusion that irritating substances derived from disintegrating lens matter were the direct cause of the independent lesions in the iris, ciliary body, and retina. The choroid, being protected by the retina, was not involved. One of the reasons the ciliary body escaped so lightly may have been

Table 1

COMPARISON OF THE REACTION OF THE RETINA IN THE VARIOUS DISEASES MENTIONED

		Endophthalmitis	Atrophic Globe after Endophthalmitis	Sympathetic Iritis	Spontaneous Iritis Serosa	Traumatic Iritis Serosa
Anterior chamber		Hypopyon	Sometimes membranes	Sometimes deposits	Deposits	Deposits
Iris		Purulent inflammation	Moderate infiltration, plasma cells	Mononuclear infiltration. Often nodules of epithelioid cells	Lymphocytes with plasma cells; lymphocytic nodules	Lymphocytes with plasma cells; lymphocytic nodules
Ciliary body		Purulent inflammation	Membranes	Nodules of epithelioid cells in vascular layer	Lymphocytic nodules; proliferation of pigment epithelium after membranes	Mononuclear infiltration; sometimes deposits
Vitreous		Abscess	Abscess with membranes	In pure cases free	Isolated cells and membranes	Isolated cells with deposits
Retina	(*a*) Position	*In situ*	Detached	In pure cases *in situ*	In late cases, detached	In pure cases *in situ*
	(*b*) Tissue	Purulent inflammation perivasculitis	Degeneration	Normal, as a rule	Often degenerated in late cases; moderate perivasculitis	Plasma cells with lymphocytes in fiber layer; special perivasculitis
	(*c*) Surface	Pus	Membranes	Nothing	Free membranes often	Deposits
Choroid		Mostly free	Often lymphocytic nodules	Nodules of lymphocytes with epithelioid cells	As a rule, lymphocytic foci	Free
Optic nerve		Purulent inflammation	Atrophic, often swollen in recent cases	Free in pure cases	Inflamed or atrophic	Inflamed

due to the fact that only the internal surface is exposed to the aqueous.

Interpretation of the clinical aspects of retinitis serosa from the pathologic findings

1. The diagnosis of atrophic globe, so often made in the histories, was not correct. It is true that some of these eyes may have exhibited hypotension, but that was due to infiltration of the ciliary body by lymphocytes, just as in an ordinary case of iridocyclitis. Some of the globes showed signs that the inflammation was subsiding, and it seemed that a few of them might have been saved. The essential symptoms of an atrophic globe, namely, membranes on the flat part of the ciliary body and detachment of the retina, were not present. It is unlikely that any of these eyes would have gone on to actual shrinkage.

2. The failing vision in these globes was due not to a detachment of the retina, but to the presence of a characteristic process in its stroma and in the papilla.

3. The reason assigned for the removal of most of these eyes, namely, fear of sympathetic ophthalmia in the fellow-eye, was justifiable in certain cases, inasmuch as out of 59 cases six, that is about 10 percent, revealed the specific sympathetic infiltration in the choroid.

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A CASE OF HIGH ESOPHORIA STUDIED BY EYE-MOVEMENT PHOTOGRAPHY

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The binocular behavior in a case of high esophoria was studied, using an eye-movement camera which recorded the vertical and horizontal movements of both eyes. The data obtained were compared with similar data from previous studies of exophoric and orthophoric eyes. The esophoric subject showed consistent tendency to over-converge in reading and during simple interfixation movements. These over-convergence movements were consistently smaller than those in a group of highly exophoric subjects previously studied. The subject required on the average 3.9/25 seconds to complete abductive movements to correct for the over-convergence occurring during the return sweeps to the beginnings of the lines in reading. The photographic records also showed a consistent tendency of the eyes to move up and then back down in moving between two points separated horizontally. The possible significance of these results in relation to binocular training is briefly discussed. From the Psychology Laboratory, University of Southern California.

Introduction

Esophoria has been studied by numerous research and clinical workers for years, but their papers have been limited, almost without exception, to discussions of subjective phenomena. Purely objective data on the binocular behavior of the eyes were gathered as early as 1907 by Judd,[10] who studied convergence and divergence movements. Schmidt,[11] in 1917, found marked discrepancies in the binocular behavior of the two eyes in reading. These discrepancies were found to be especially pronounced as the eyes moved from the end of one line to the beginning of the next. The importance of differences in the binocular behavior of the eyes has been indicated by the work of Eames.[8, 9] He found that there was a greater percentage of exophoria in cases of reading disability than in students who were making normal progress in reading. Betts[1] has also emphasized the importance of such factors.

Clark[3] has made an objective study of the effect of exophoria on the behavior of the eyes during reading. It was found that all of the subjects made convergence movements in moving the eyes from the end of one line to the beginning of the next. This required that the eyes make abductive adjustments at the beginning of the lines. Further data[4] also showed that a group of cases of high exophoria (15-24 diopters) made significantly greater corrective abductive movements during the first fixation at the beginning of each line. These movements averaged over 3$^{\Delta}$ and were as large as 9$^{\Delta}$ in some cases. In another study[6] an exophoric group showed a greater tendency of the eyes to diverge as the subjects read through a line. Clark also found that for simple interfixation movements the extent of the over-convergence increased directly with the interfixation distance within the limits of the experimental procedure (8-26 degrees).

Since a study of high exophoria disclosed certain anomalous binocular habits, it seemed that a study of high esophoria might throw some additional light on the general problem of binocular vision. Inasmuch as cases of high esophoria are difficult to obtain for experimental purposes, it was thought that a report on this single case would be worth while in spite of the limitations of the study of a single subject.

The subject was a man 22 years of age. His prescription was O.D. + 2.00 D. sph., O.S. + 3.00 D. sph. He admitted that he did not wear his glasses regularly; nevertheless, they gave him better than standard vision at 20 feet. Without his lenses he showed 10$^{\Delta}$ of esophoria at 20 feet and 14$^{\Delta}$ of esophoria at 13 inches, the distance at which the reading was done in the experiment. There was, however, considerable variation in these measurements, and at times he exhibited as much as 18$^{\Delta}$ of esophoria at the reading distance.

Experimental procedure and results

The experimental procedure was the same as that used for the previous experiments described above. The camera for photographing the eye movements has been described elsewhere.[2] It uses the well-known corneal-reflection method, but has two distinct advantages over other cameras; namely, it records the horizontal and vertical movements of both eyes on a single record, and the movement of the corneal image is magnified 14 times. Time is indicated in 1/25 seconds.

First, the subject's eyes were photographed while he read (without his lenses) two paragraphs of rather difficult material. The lines were 15 cm. in length, the print 10-pt. Caslon, and the reading distance 13 inches. After a short rest period the eye movements were also recorded while the subject alternately fixated isolated words placed at the four interfixation distances indicated in table 1. The whole testing period lasted approximately one-half hour. This included the time for instructions, rest periods, and actual recording.

1. Reading. An examination of the behavior of the eyes at the beginning of the lines revealed that in every case there was an abductive adjustment to correct for over-convergence during the return sweep. The average extent of these movements was found to be 62.0 ± 11.7 minutes (2$^{\Delta}$), whereas a control group[3] with "normal" binocular balance averaged only 30.0 ± 9.5 minutes (1$^{\Delta}$), and a group with very high exophoria[4] averaged 102.0 ± 34.8 minutes (3$^{\Delta}$). The average time required to complete these divergence movements was found to be 3.9/25 seconds, whereas the control group required 2.3/25 seconds, and the group having high exophoria averaged 4.3/25 seconds. These data tend to indicate that subjects with esophoria as well as those with exophoria required more time to complete these divergence movements at the beginning of the lines. It was also found that the esophoric subject made corrective abductive movements at the beginning of 31 percent of the fixations within the lines. The group with high exophoria made these movements 32 percent of the time, but the control group made them only 15 percent of the time.

It can be seen from these data that during a reading period both eyes with normal and abnormal binocular balance receive abductive "fusion" training at the beginning of each line and also at the beginning of some of the fixations within the lines. It is particularly significant that this was true of the subject with esophoric eyes as well as of those with exophoria, although the latter made larger abductive movements to correct for equally larger over-convergence movements. These data show that the eyes during routine seeing react in a manner quite different from the tendency that is shown in a test for binocular balance. It might be expected a priori that high exophoria would be associated with a divergence of the eyes during routine visual tasks, and that esophoria would be associated with a similar tendency to turn in. As a matter of fact, the reverse is true of the exophoric eyes.

2. Simple interfixation movements. The data for the simple interfixation

movements are summarized in table 1. The subject changed his fixation between words placed at the distances indicated keeping time with a metronome beating 90 times per minute. The card upon which the words were mounted was placed 13 inches from the subject's eyes. The table also includes data for a group with high exophoria[6] and a group of subjects with "normal" binocular balance.[5]

Table 1

COMPARING THE ABDUCTIVE MOVEMENTS NECESSARY TO CORRECT FOR OVER-CONVERGENCE IN CHANGING FIXATION BETWEEN WORDS AT FOUR INTERFIXATION DISTANCES.

Interfixation distance	26.4°	20.6°	14.3°	8.6°
High esophoria	69.0′	92.4′	46.8′	15.6′
Control group	84.5′	67.1′	42.3′	28.7′
High exophoria	102.0′	94.8′	79.2′	51.6′

These data show that there was no consistent difference between the behavior of the eyes of the subject with high esophoria and that of the "normal" group. Both showed a definite over-convergence during the interfixation movement and an abductive adjustment during the first part of the fixation, but the esophoric eyes overconverged no more than the average of the control group. The exophoric group, however, consistently made larger abductive adjustments to correct for larger over-convergence movements. These data confirm the findings of the previous section in showing that the subject with esophoria did not differ from the control group as much as those with high exophoria did.

The time required to complete these abductive movements was also determined. The data are summarized and compared with "normal" and exophoric groups in table 2. The results show that the esophoric subject required slightly more time than did the group with exophoria but did not differ consistently from the control group.

Table 2

TABLE SHOWING THE TIME IN 1/25 SECONDS REQUIRED TO COMPLETE THE ABDUCTIVE MOVEMENTS AFTER SIMPLE INTERFIXATION MOVEMENTS.

Interfixation distance	26.4°	20.6°	14.3°	8.6°
High esophoria	6.5	7.7	5.0	4.5
Control group	5.6	5.6	5.9	5.6
High exophoria	4.8	5.0	4.9	4.3

3. Vertical movements. All of the data described above are concerned only with horizontal movements. As a matter of fact, vertical movements occurred with the horizontal movements. During the simple interfixation movements the eyes not only over-converged, but they also moved up. This required a corrective downward and abductive movement during the initial part of the fixation. This was also true in reading.

The average extent of the vertical component of movement for the two larger interfixation distances was found to be 58.5 minutes as compared to 72.0 minutes for the control group. This difference is not statistically significant. The average time required to complete the vertical component was found to be 2.5/25 seconds with a range from 1.5 to 3.5/25 seconds. These data show that the eyes of the esophoric subject, in shifting between two points, moved up and converged. The time required to make this saccadic movement was approximately 1/50 second, the smallest period of time that could be accurately estimated on the records. During the initial part of the fixation the eyes moved down and diverged for approximately 2.5/25 seconds and then continued to diverge for approximately the same length of time. The whole movement was completed in approximately 1/5 second.

Summary and conclusions

The binocular behavior of a patient with high esophoria was studied using an eye-movement camera which recorded the vertical and horizontal movements of both eyes with relatively high magnification. The data obtained were compared with those from a group with high exophoria and a group of subjects having "normal" binocular balance. Although the data from one subject cannot be considered conclusive, the following tentative conclusions appear to be justified:

1. In a reading situation an esophoric subject made greater over-convergence movements during the return sweeps

to the beginning of the lines than did a control group, but these movements were smaller than those of a group with high exophoria. The average extent of the movement for the esophoric subject was approximately 2Δ.

2. The subject required on the average 3.9/25 seconds to complete the abductive corrective movement.

3. His eyes also over-converged during the saccadic movements within the lines, but this over-convergence was approximately the same as that obtaining in an exophoric group.

4. The esophoric subject over-converged during all of the simple interfixation movements. This required abductive adjustments (averaging 2Δ for the two largest interfixation distances) during the initial part of the fixation. These over-convergence movements were not consistently different from those in a control group having "normal" binocular balance but were consistently smaller than those in cases of high exophoria.

5. The subject with high esophoria completed these divergence adjustments in approximately 5/25 seconds. This time did not differ reliably from the time required by those having high exophoria and the individuals with "normal" binocular balance.

6. The eyes moved up and converged during the saccadic movements between the isolated words. This required a downward as well as an abductive movement during the initial part of the fixation. The average extent of the vertical component was 58.5 minutes, and approximately 2.5/25 seconds was required to complete it.

In general, the data suggest that esophoric, exophoric, and orthophoric eyes are continuously being subjected to "fusion training" not only in reading but in the simple process of moving the eyes from one point to another in space. The data for all of the individuals studied showed that the "fusion" movements, with but one or two exceptions, were abductive in nature. These findings raise the question of the theoretical, if not practical, implications of adductive "fusion training" for a limited time during the day while the eyes are getting abductive training for the remainder of the individual's waking hours. In the case of certain types of abductive "training" the "exercise" period merely adds to the "training" which takes place continuously. These data indicate that a careful analysis of "fusion-training" devices should be made in terms of just what is happening to the eyes in the routine business of seeing.

The data on simple saccadic movements also indicate that the abductive "fusion" movements may occur when base-out prisms are used in training. If interfixation movements occur, the eyes may over-converge as they did in these experiments and actually make abductive movements to "fuse." The data also suggest a similar thing in regard to the so-called "jump" method of "fusion" training; namely, the eyes may actually over-converge and make abductive "fusion" movements. These findings show the need of a careful analysis of just what is happening to the eyes in binocular training devices. If such an analysis is not made, an effect opposite to that desired may be obtained.

These findings also point to marked discrepancies in the behavior of the eyes throughout. The discrepancies indicated by divergence movements made from fixation to fixation within the line, show that an area on the retina as large as 72 minutes may be used to "fixate" a point during routine reading. This tends to corroborate earlier findings and would suggest a reinterpretation of the "law of corresponding points."

Finally, these data suggest that during normal binocular vision the eyes react in a manner quite different from what might be expected from data taken during tests in artificial situations. A finding of high exophoria might lead one to assume that the eyes tend to turn out during normal binocular vision, whereas they actually over-converge. This may be due to an over-compensation for the high exophoria, but by that token esophoric eyes would be expected to diverge less than those with "normal" binocular balance. This, however, is not the case, at least not in the subject studied. Fatigue is probably an

important factor in this problem. All of the data presented, however, were taken over a very short period of time, so that fatigue could not have been important. (An investigation of the effect of fatigue on these findings is being undertaken in this laboratory; likewise, the part that accommodation plays in this process.) The results also indicate that eye-movement photography presents an approach to the study of binocular phenomena which may well have numerous practical as well as theoretical implications.

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NOTES, CASES, INSTRUMENTS

FUNDUS FINDINGS IN TUBEROUS SCLEROSIS

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According to Critchley and Earl,[1] the earliest case record of tuberous sclerosis was probably described by von Recklinghausen[2] in 1863. However, Bourneville[3] was the first to recognize this condition as a pathological entity when he drew attention to a rare form of multiple cerebral sclerosis occurring in young mentally deficient epileptic patients. Consequently, the disease is frequently referred to as Bourneville's disease. Van der Hoeve[4,5,6] drew attention to the occurrence of flat tumors on the retinae of patients suffering from this condition. These lesions in the retina appear as oval or circular areas, white or gray in color, situated away from the disc; they manifest no relationship to the blood vessels nor is there any reaction in the surrounding tissues. No papilledema is noted, in spite of the extensive cerebral lesions. These "spots" on the retina were labeled "Phakomata" by Van der Hoeve from the Greek word "Phakos," meaning a spot. He also termed the condition "Neurofibrillophakomata retinae" when he showed that the eye tumors consisted mainly of neural fibers. Sections exhibited by him showed these lesions to affect, as a rule, mainly the nerve-fiber layer of the retina and nearly always to contain cysts which have no special wall: occasionally other layers may be affected. The more recent articles by Gottlieb and Lavine,[7] discussing the neuropsychiatric aspects, and by Stewart and Bauer,[8] on the basic pathology of the condition, have appeared in the English literature. Dickson [9] amongst others believes that there is a very close relationship between tuberous sclerosis and von Recklinghausen's disease, while Van der Hoeve believes that the triad of diseases, namely, tuberous sclerosis, von Recklinghausen's disease, and von Hippel-Lindau's disease, are intimately associated the one with the other, Bourneville's disease being absolutely restricted to the cerebrum, von Hippel-Lindau's disease principally lodged in the cerebellum, the medulla, and the spinal cord, while von Recklinghausen's disease affected the cranial nerve, the peripheral nerves, and the sympathetic system. Feriz[10] clearly showed the very close parallelism between the lesions of the gray matter of the brain in tuberous sclerosis and the retinal lesions. Sections taken from the retina showing the disturbances of the fine structure of its superficial layers, the incomplete formation of ganglial cells around the foci, the appearance of atypical nervous tissue resembling that of neurolgia, all components of which are responsible for the sclerosis, bring out strong evidence that the lesions in the retina are essentially the same as those that occur in the brain.

The ophthalmoscopic findings in these cases are thus of great importance, for, essentially, one is given an opportunity of seeing in the fundus positive proof of what one then knows to be present in the brain.

It should not be concluded that the disease is as uncommon as the very few reports in the literature would lead one to believe. A great many of these cases are probably diagnosed incorrectly. The following case report attempts to focus attention again upon the disease.

Report of a case

J. S., a white male, 26 years of age, was brought to the County General Hospital for mental observation, because of "epileptiform seizures," and progressive mental deterioration. The patient came from a family of seven siblings, all healthy with no history of epilepsy, mental deficiency, nor skin trouble of any kind in the family. Special inquiry was made as to facial skin lesions among brothers and sisters, but without results. The "fits" were said by his sister to have occurred almost daily, sometimes as many as four or five in a day. They had begun in his ninth year of age, were quite severe, and appear to have been of typical grand-mal type.

His family physician had prescribed phenobarbital, gr. 1½ b.i.d., which kept the attacks under fair control as long as he took medication. He never progressed further in school than the second grade and was unable to read or write.

Because of frequent seizures and mental deterioration, he had been transferred to the Milwaukee County Asylum for the Chronic Insane, where he is now a patient.

Physical examination revealed a well-developed, well-nourished white male, who smiled readily and attempted to coöperate. His mental rating was that of a boy 4½ years old. He showed a peculiar condition of the skin of the face, distributed in the shape of a butterfly over the nose, cheeks, and forehead. The lesions consisted of almost spherical nodules, varying from the size of a millet seed to that of a pea, were crowded closely together near the site of the nose, and of a firm consistence. These lesions are known to dermatologists as adenoma sebaceum. Mental deficiency was quite evident.

The patient thus presented the three principal findings characteristic of the disease: epileptic seizures, mental deficiency, and adenoma sebaceum. Tuberous sclerosis is characterized by faulty development of ectodermal structures, such as the skin, brain, and so forth. Among the ectodermal tissues showing tumorlike lesions belongs the retina, and this patient had retinal changes.

Eye examination: Right Eye. It was impossible to take the vision due to the mental condition of the patient. The pupil, 3 mm. in size and regular, reacted rather sluggishly to light and accommodation. The fundus examination showed the optic disc to be normal, the blood vessels also normal. Situated about two disc diameters nasal to the disc were two irregularly oblong white patches. These patches were fairly well defined and situated in the nerve-fiber layer of the retina. There were no other noticeable abnormalities.

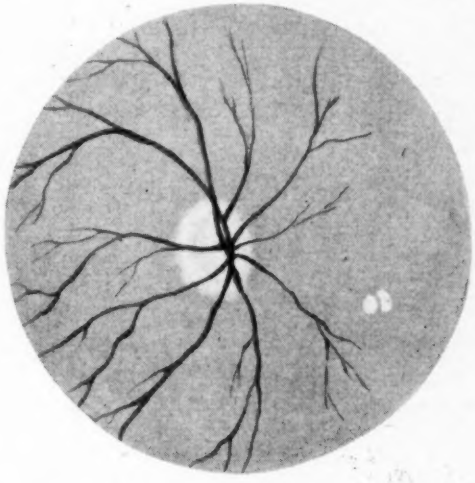

Fig. 1 (Storchheim and Taube). The appearance of the fundus in a case of tuberous sclerosis.

The left eye was essentially normal.

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A GRAPH FOR RECORDING RESULTS IN DARK ADAPTATION*

JACOB B. FELDMAN
PHILADELPHIA

After examining over 1000 cases it was thought expedient to record the information gathered on the dark-adaptation test upon a single chart, thus to facilitate comparison either with previous results on the same case, or with the graphs of cases of similar or other ocular pathologies. The chart as shown is divided into A, B, and C (fig. 1).

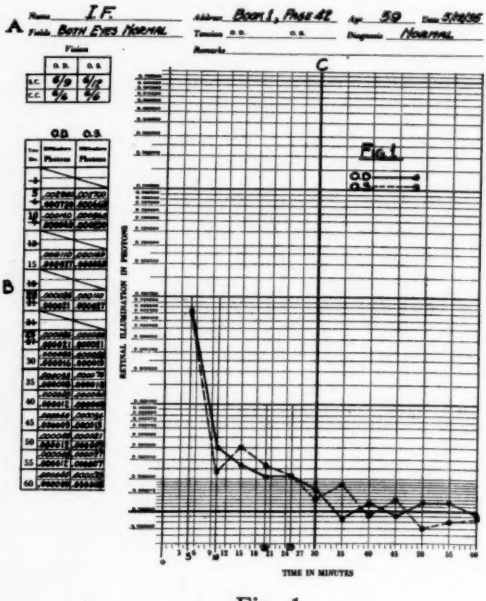

Fig. 1

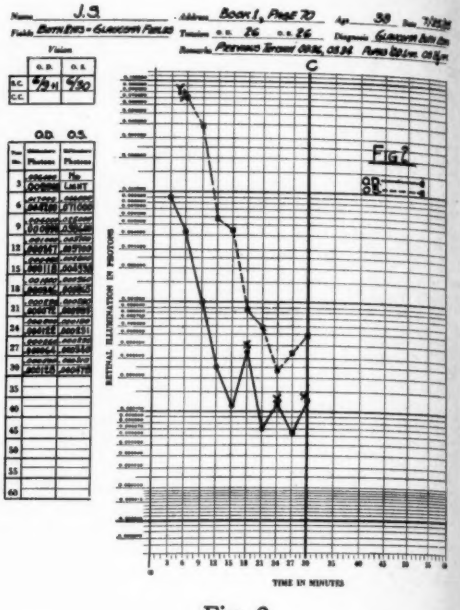

Fig. 2

Fig. 1 (Feldman). This is a normal graph. Whenever a record of a threshold goes below .000010 photons as in O.D. at 35 minutes and O.S. at 40 minutes it is not necessary to continue threshold readings as the case is definitely normal.

Fig. 2 (Feldman). Graph of a glaucoma case. Note "absolute rod suppression" O.S. at 3 minutes (marked y), and "rod suppression" O.D. at 18, 24, and 30 minutes (marked x).

A consists of a brief résumé of important data requisite to the study of dark adaptation.

B consists of the tabulated results obtained in the study of the threshold. In the first column there is a series of figures representing recordings in minutes of the light threshold. The printed form is in multiples of 3 up to 30 minutes, then in multiples of 5 up to one hour. Where for any reason an examiner desires to change the minute readings, the printed form allows space for substituting the time in minutes to be used (see B, fig. 1). To the side of the minute readings are two columns devoted to notations of the right and left eyes. Each threshold reading has the upper space reserved for results in millilamberts, and the lower space for its equivalent in photons. Since this study was primarily an ophthalmological one, the photon factor was deemed preferable, although the accompanying graph is easily adaptable for millilambert use.

C is the graphic representation of a series of light thresholds taken at regular intervals. A graph of a number of thresholds is preferable to a single threshold reading, in that it shows the behavior of the eye during the entire course of dark adaptation. A single threshold reading may accidentally re-

* From the laboratory of Physiologic Optics, Wills Hospital.

cord high, due to inattention on the part of the patient and thus prove misleading. The normal graph assumes the shape of a hyperbola, a deviation in the contour of the graph would indicate pathology (see C, fig. 1 and compare with C, fig. 2).

The graph C is arranged logarithmically and the normal level is represented by a heavy line at .000010 photons; above .000020 denotes pathology. When in the course of the hyperbola there is a crater formation due to the sudden loss in light sensitivity, this has been called "rod suppression" (see x in C, fig. 2). Where this rod suppression is so intense that for a short interval of time no light whatever is seen with the dark adapter, and then the light sense returns, the interval of no light sense obtainable is called "absolute rod suppression" (see y in C, fig. 2). If no light sense is obtainable between the first 9 and 12 minutes of dark adaptation, where the reading is taken at three-minute intervals with our instrument, it has been found that no light sense will ever be obtainable. This is called "total absolute rod suppression."

The greatest intensity of light obtained by our instrument is 1.3 millilamberts,* the illustrated chart is now being used for plotting graphs for dark-adaptation studies.

20th and Chestnut Streets.

A HOLDER FOR TREPHINE BLADES AND A SERRATED TREPHINE BLADE

FREDERICK O. SCHWARTZ, M.D.
SAINT LOUIS

Here is presented a new holder for trephine blades. One end has a chuck and collar to hold the blade; the other tapers and is bluntly rounded. There is a band of checkering just above the chuck to insure a firm grasp on the instrument during rotation.

Several advantages are combined in the design. It is longer and heavier than the Elliot or Walker holder, and is more stable during the cutting because it is long enough for the blunt end to rest against the side of the index finger. Its additional weight causes penetration without the application of much pressure. These features insure less wobbling during the circular cutting process.

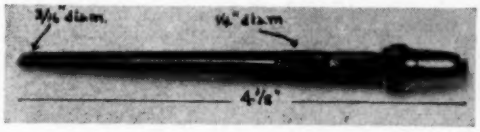

Fig. 1 (Schwartz). Holder for trephine blades.

It is made of stainless steel; the dimensions are given in the cut. I have used it with much satisfaction.

This blade has a circular serrated cutting end composed of four teeth, each having two edges, set at an angle of one hundred degrees to each other, which are finely sharpened on both sides of the angle.

It is about 2.5 cm. long and may be obtained in diameters of 1.0, 1.5, and 2.0 mm.

Fig. 2 (Schwartz). Serrated trephine blade.

The instrument is fixed in a chuck and rotated. The cut is made rapidly and ocular tissues are penetrated without much effort.

It is recommended particularly for tough scleras.

508 North Grand Boulevard.

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* Feldman, J. B. Instrument for determining course of dark adaptation and for measuring minimum light threshold. Arch. of Ophth., 1934, Vol. 12, July, pp. 81-85.

SOCIETY PROCEEDINGS

Edited by Dr. H. Rommel Hildreth

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on Ophthalmology

October, 1935

Dr. J. Milton Griscom, chairman

Multilocular cyst of the iris

Dr. Charles A. Rankin gave a brief discussion of Parson's classification of iris cysts with special reference to the implantation type. He reported a case in which one main cyst occupied the anterior chamber between the 8:30- and 10-o'clock position, and two smaller cysts extended from the main cyst out into and involving the pupillary space. There was a history of injury two years previously, with no increase in size nor change in appearance in four months.

Cystlike ectropium uveae

Dr. Alfred Cowan presented two sisters and two children of one of them, four in all, with congenital cysts and flocculi of the retinal pigment layer of the iris. A complete description with drawings was published in this Journal (1936, v. 19, p. 287).

Discussion. Dr. T. B. Holloway said that about twenty years ago a man had come to Dr. deSchweinitz's clinic at the University Hospital suffering from a bilateral glaucoma. In one eye a pigmented mass projected beyond the pupillary border, apparently pushing in between the lens and the iris. Later this mass completely disappeared only to recur at a subsequent date. As is now well known, such cysts may form in the pigment layer of the iris and ciliary body in connection with glaucoma or after inflammatory conditions of these structures. These various types were mentioned because they seemed to be in some way related to Dr. Cowan's case. Dr. Rankin referred to diabetes, saying that every experienced operator has seen the escape of an inky fluid into the anterior chamber when performing an iridectomy in certain cases of diabetes. But this same thing might occur in the absence of an active diabetes, as was shown several years ago in two patients whose urine was free from sugar and the blood sugar well within normal limits.

Dr. Alfred Cowan said regarding free cysts in the anterior chamber that they were supposed to be cysts that were previously attached by a pedicle which had torn loose. But nowhere had he seen nor does there seem to be a record of a case in which a free cyst was found in the presence of other attached cysts.

Dinitrophenol poisoning with cataract

Dr. Edmund B. Spaeth reported a case which has been published in this Journal (1936, v. 19, p. 320).

Rapidly developing cataracts following the use of dinitrophenol

Dr. Willard G. Mengel (Camden, N.J.) reported the case of a woman aged 33 years whom he had first examined on June 3, 1935. About thirty or forty dotlike opacities were detected in the anterior lens cortex beneath the capsule; otherwise both eyes were normal. In six weeks there was considerable swelling of each lens. The vision was 6/21 in each eye. A milklike haze was seen through the dilated pupils. The "Y" sutures were broad and prominent, appearing as though they were about to burst open, not unlike a ripening chestnut bur. The intraocular tension was normal. Eight weeks following the initial examination the vision was reduced to light perception.

Operation was performed on the right eye on September 9, 1935, and deferred on the left eye for a few weeks. By linear extraction the soft lens material was completely removed without difficulty. Convalescence following the operation was rapid and without complication. Permanent glasses were not ordered, but trial refraction showed the vision to be 6/12 plus.

A calculation of the amount of sodium alphadinitrophenol used showed that approximately 118,000 mg. had been taken during the 15-month period from March, 1934, to June, 1935. During this period there had been a reduction in weight from 217 pounds to 170, a total loss of 47 pounds.

The striking features of the case were the rapid development of identical cataracts simultaneously in each eye, the comparative youth of the patient, and the absence of diabetes and trauma. Except for the use of dinitrophenol no other etiological factors were present. From this apparent association of dinitrophenol with cataract formation it would seem that the use of the drug is definitely contraindicated.

Discussion. Dr. Edward Steinfield said that the fact that mild tetany occurred in Dr. Spaeth's patient when the calcium fell to 7 mg. per 100 c.c. (the critical level) simply indicated a hypocalcemic tetany though the proportionate lowering of phosphorous was not characteristic of parathyroid deficiency. Tetany might appear at higher calcium levels if there was a rapid drop such as in parathyroidectomy. On the contrary, low figures might be noted in nephrosis due to loss of the components bound with protein and yet without tetany. The prompt recovery after administration of parathyroid extract was, however, suggestive. Whether disturbances of calcium metabolism would be found in other cases of dinitrophenol cataract, he did not know. The possibility of associated nutritional disturbances due to a rigid or unbalanced diet should of course be kept in mind. It would appear advisable to investigate future cases of this character along the lines suggested by Dr. Spaeth's paper.

Dr. Louis Lehrfeld said he would like to place on record at this time a case similar to that reported by Dr. Mengel. The patient, a nurse, aged 27 years, complained of failing vision. Routine ophthalmoscopic examination revealed small punctate dots in the posterior cortex of each lens. At first he thought that they were congenital and paid no particular attention to them. When she returned with her new glasses he found that the vision was less than before and that the punctate dots were now striate opacities. These increased rapidly from day to day until 40 days from the first examination she had fully mature cataracts. Her employer, a physician, advised that one year previously she had taken a course of dinitrophenol therapy. At that time she developed definite loss of hearing which returned after treatment. Because of the patient's attitude of secrecy in relation to history, it was believed that she had taken dinitrophenol just prior to her recent eye trouble. The patient's vision was reduced to light perception in both eyes. The cataracts were removed by simple extraction. Four months after the original visit the patient returned to full services with full binocular vision, visual acuity being 5/5 in each eye.

A review of infrared photography and its use in ophthalmology

Dr. Jacob B. Feldman read a paper on this subject which will be published in the Archives of Ophthalmology.

A. G. Fewell,
Clerk.

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

Section on Ophthalmology

November 8, 1935

Dr. H. E. Binger, president

Retinal cysts

Dr. Egil Boeckmann, St. Paul, presented a patient with this condition and, as Dr. Burch had seen the patient and was going to puncture the cysts the following morning, he asked Dr. Burch to make some comments on the case.

Discussion. Dr. Frank Burch, St. Paul, said that he had never before seen transparent, circular, discrete retinal structures like these. The manner of origin of cysts of this character was difficult to understand. As Dr. Boeckmann suggested, the cysts must lie within the layers of the retina, since the retinal vessels curved over them, and they apparently contained very transparent

fluid and no pigment. When this patient had been seen by Dr. Burch on the previous day, the tension in each eye was 17 mm. Hg (Schiötz-Gradle).

Sympathetic ophthalmia

Dr. F. J. Pratt, Minneapolis, stated that some months ago he had asked for assistance from the Academy members in getting blood from a patient who had had sympathetic ophthalmia to be used on one of his patients. Dr. Lee Simons (by invitation) read the following report:

A boy, aged 11 years, was first seen at the Minneapolis General Hospital on December 18, 1934, complaining of blurred vision in the right eye. The left eye was blind from an old buckshot injury in October 1928. Seven weeks after the injury, the right eye had blurred slightly, and the following morning it was a little reddened, sensitive to light, and teared somewhat. That day, on admission to the General Hospital, examination revealed a blind left eye with ciliary injection, scarred cornea, anterior chamber filled with exudate, and invisible fundus. The right eye had 10/200 vision, low tension, mild ciliary injection, a pupil responsive to light and accommodation, and slight ciliary tenderness. The left eye was enucleated at once, and autogenous blood serum was given intramuscularly according to the method of Fischer. Atropine and salicylates were administered and the patient was discharged December 29, 1934, as improved. Vision was then 10/200.

On January 8, 1935, there was a recurrence of the symptoms. All the signs of a sympathetic ophthalmia were present. In the hospital the patient was given a course of intravenous typhoid injections, with good temperature reactions, followed by autohemotherapy, along with atropine and salicylates. The patient wished to leave the hospital for a while, so was discharged unimproved on March 25, 1935; vision was ability to count fingers at four feet.

He returned to the hospital on March 29, 1935, and was given a course of intramuscular milk injections, followed by convalescent whole blood from a patient suffering with sympathetic ophthalmia. A progress note written on May 2, 1935, read, "To date, no improvement has been noted; vision, finger counting at four feet." Artificial fever by means of diathermy was resorted to on May 4th, with a temperature of 105 degrees to 107 degrees rectally, sustained over a period of three hours. A progress note on May 6th read, "Fundus more clearly visible than for several weeks." On May 8th the patient could count fingers at fifteen feet; he was discharged for a consultation with Dr. Burch who reported a favorable prognosis. When readmitted six days later, his vision had fallen somewhat, the fundus was not visible because of a cloudy vitreous, and there was an increase in the number of K.P. He was given more intravenous typhoid, atropine, and heat, together with phototherapy, but showed no improvement. On May 18th, another diathermy treatment was given, and two days later the fundus could again be fairly well seen and the vision had improved. Three more such treatments were given at intervals of seven days and the patient was discharged on June 19, 1935, with a fairly quiet eye and improved vision.

His condition was followed in the dispensary, and improvement was steady. On November 7th, the vision was 20/20 with — 5.50 D.sph ⊂⊃ — 0.75 D. cyl. ax. 165°.

Discussion. Dr. W. E. Camp, Minneapolis, said he had seen the microscopic slides of the injured eye in this case and there was no doubt about the diagnosis of sympathetic ophthalmia.

Dr. F. E. Burch remarked that possibly hyperpyrexia marked a milestone in the therapy of sympathetic ophthalmia. Clinical reports recently published show very good results in this type of ocular disease, and this may be something for ophthalmologists to bear in mind as a valuable asset in the treatment of migratory uveitis. Dr. Burch said that during the past year he had seen a case of sympathetic ophthalmia distinctly improved by heroic treatment with salicylates (given by enema) every night, and triple typhoid injections re-

peated as soon as the leucocyte count returned to normal. Treatment had covered a period of three months. At the last examination of this patient Dr. Burch was astonished to find the man's vision restored so that he was able to read a newspaper. Thus, once in a while, a case of sympathetic ophthalmia is not nearly so hopeless as is usually believed, and persistent treatment is occasionally worth while, as it was in this case.

Restoration of the lacrimal duct

Dr. C. N. Spratt, Minneapolis, showed moving pictures in which the operation of Callahan was used. The paper will be published in this Journal.

The chemistry, action, and uses of dinitrophenol

Dr. Reuben Johnson, Minneapolis (by invitation) said that dinitrophenol is related chemically to picric acid, which is trinitrophenol. It came forcibly to the attention of physicians, especially in France, at the time of the World War, because of the poisoning of munitions workers. The next important publication came in 1933, when Tainter, Stockton, and Cutting of Stanford University reported on the clinical use of dinitrophenol in a large group of cases of obesity.

The primary effect of dinitrophenol is that of a powerful, chemical stimulant to cellular activity, as a result of which it produces secondary increase of metabolic rate, tachycardia, tachypnea, peripheral vasodilatation, and fever which may even become a fatal hyperpyrexia. A third effect is toxic manifestations, especially gastric irritability, a distinct tendency to the development of peripheral neuritis, affecting especially the nerve of taste, and a toxic dermatitis. It is marketed as a proprietary medicine under the names of "Slendite" and "Dinitrofenol," it has been tried in a number of clinical conditions, and is not a satisfactory substitute for thyroid extract in hypothyroidism. It has been used with mediocre success in cases of insanity and peripheral vascular disease, but its chief use has been in reducing obesity. After two years' experience, a final report came from Stanford University on the treatment of 170 cases of obesity. The authors state that if more than 300 mgm. per day was taken, skin rashes or peripheral neuritis occurred in 35 percent of the cases. They found dinitrophenol a highly effective drug for weight reduction, but suggest its use only when all other forms of treatment have failed.

Discussion. Dr. E. A. Loomis, Minneapolis, briefly reported two cases of dinitrophenol cataract that had come under his observation.

Case 1. The patient was a woman, aged 43 years, who came to his office on June 6, 1935. She was very nervous and worried about going blind and thought it was due to taking reducing medicine. On testing, her vision was light perception in the right eye, and 6/30 in the left eye. Dr. Loomis removed the lens. There were no complications and the resulting vision was 6/6. The lens was absolutely white, not the usual amber color, and the cortex very firm. The cataract came out in capsule. He removed the left cataract on September 23, 1935. The vision was 6/6.

Case 2. The patient was a 46-year-old woman, who came to his office on September 4, 1935. She had light perception in each eye. In this case an acute glaucoma developed six weeks after the right cataract had been removed, the tension reaching 80 mm. Hg (McLean). Vision was 6/60. Besides routine treatment, Cortin was used, one ampule each day for five successive days, but there was no improvement in the glaucoma until after three weeks, when the tension and fields were normal, vision 6/6.

Both patients had started taking dinitrophenol in February, 1934, a dose of 1½ grains having been ingested three times a day for three or four months. They both had practically the same symptoms after using the drug; that is, fever, profuse sweating, weakness, fatigue, and nervousness.

Dr. C. N. Spratt, Minneapolis, stated that he had seen three patients with dinitrophenol cataracts in consultation, upon one of whom he had operated for removal of the cataract. This patient

had an intraocular tension of 80 mm. Hg (McLean) before the operation.

Dr. Frank Burch, St. Paul, said he had seen three cases of this type, in patients 42, 29, and 44 years of age, respectively. One of these had come to operation, with good results. The outstanding characteristic of the cataracts in this group was the rapidity with which they had developed. In one of the patients, the total amount of dinitrophenol taken between May 11, 1934, and October 16, 1934, was only 562 grains, much less than in most of the cases reported in the literature in which the exact quantity was known. None of the cataracts seen by Dr. Burch had any of the characteristics of cataracta complicata. There was no uveitis, and apparently no unusual deep change within the eye in the two patients whose cataracts had been removed.

In the case which Dr. Burch presented at the meeting, the main feature seen under the slitlamp was the large water clefts, especially in the right eye; the opacities otherwise were small and dotlike, scattered throughout the lens substance.

While it appears evident that it must be a toxic factor that produces the lens changes, just as in diabetes and in experimental naphthalene cataracts, yet nearly all of these patients had some dysfunction of metabolism.

Dr. James S. Reynolds, Minneapolis, reported two cases as follows:

Mrs. E. B., aged 46 years, was seen July 28, 1935. She had had blurred vision for six weeks. Vision was O.D. 6/100, O.S. 6/90. There were changes in each lens. She had taken dinitrophenol six months previously for a three-month period. The physical examination was otherwise negative.

Miss A., aged 31 years, was examined October 29, 1935. She had taken dinitrophenol three months previously for a period of two months. Vision had been blurred for three weeks: O.D. 6/60, O.S. 6/50. There were beginning central changes in both lenses. Physical examination was negative.

Dr. Reuben Johnson, in closing, said that about a year ago at the meeting of the Minnesota Society of Internal Medicine, Dr. Edgar Hermann of St. Paul had reported the results of a questionnaire addressed to representative internists, practically all of whom had given up the use of dinitrophenol or were very lukewarm toward it because of its toxicity.

W. E. Camp,
Secretary.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

November 12, 1935

Dr. James J. Regan, presiding

Tuberous sclerosis with tumor of the optic nerve

Dr. Harry C. Messinger reported the case of an Italian, aged 20 years, who for two years had had typical epileptic attacks that had increased in frequency and severity. His father and paternal uncle were also subject to epileptic seizures. The vision of the patient's right eye was reduced to counting fingers at two feet, that of the left eye was normal. The right optic disc was hidden by a white glistening mass extending forward five diopters. Neurological examination was negative except for lower facial weakness. There was no evidence of mental deficiency. Physical examination showed multiple skin tumors in the form of small pigmented fibrous nodules on the sides of the neck. The patient had been admitted to the Rhode Island Hospital because of bronchial pneumonia; there two days later, after severe frequent convulsions, he died. At necropsy multiple tumors typical of tuberous sclerosis were found in the cerebral cortex, the walls of the ventricles, the heart, and the kidneys. Pathological examination of the intraocular tumor showed cells of various shapes which somewhat resembled rods and cones and which were probably derived from the early retinal anlage.

This case showed a similarity to those reported by Van der Hoeve, Schab, and Feriz in the literature on retinal tumors in tuberous sclerosis, with the exception that the presence of cells resembling early undifferentiated

glial cells could not be demonstrated. Dr. Messinger believed that this exception was due to the fact that in his case the early retinal anlage had tended to form undifferentiated nerve cells rather than glial cells.

Etiology of trachoma and analysis of recent studies

Dr. Phillips Thygeson read a paper on this subject. A complete report of this work will be published in this Journal.

Trygve Gundersen,
Recorder.

CHICAGO OPHTHALMOLOGICAL SOCIETY

November 18, 1935

Dr. Robert Blue, presiding

Giant magnet operation

Dr. W. A. Fisher reported the case of a 35-year-old man who had been injured while pulling some slats from a tar-paper roof. He was hammering and no other person was working near him. Something had suddenly struck the left eye.

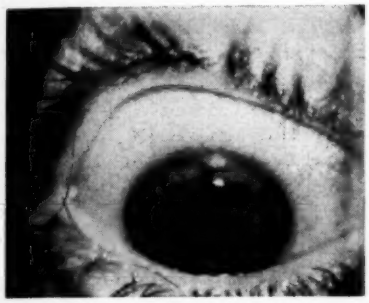

Fig. 1 (Fisher). An apparently nonmetallic foreign body, removed with a giant magnet.

A grayish-yellow mass was seen on or in the iris at the 12-o'clock position. It was not metallic in appearance but resembled plaster or stone. There was no blood in the anterior chamber and the eye was normal throughout except for a perforating wound in the cornea over the foreign body. Dr. Fisher said that the situation and color of the foreign body were such that one might easily mistake the mass for an exudate or nonmetallic substance and be led to adopt the wrong surgical procedure.

The X ray revealed a foreign body in the anterior chamber. A keratome incision was made at the 2-o'clock position to lessen the chance of iris prolapse. A toothed forceps had previously been wrapped in gauze to assure the grasping of the foreign body at the first attempt. Blood in the anterior chamber would make subsequent attempts difficult. The tip of the giant magnet was applied first and, surprisingly, the foreign body instantly adhered. It measured one by two millimeters and was black underneath. The eye healed quickly, showing no perforation of the iris, and vision was 20/20 on the seventh day.

Discussion. Dr. Oscar Nugent cited a similar case: A mechanic, 28 years of age, had sustained an injury to the left eye while hammering five days previously. A chip of steel struck the eye and passed through the sclera and ciliary body, a sufficient distance from the limbus to miss the crystalline lens, lodging in the choroid about three millimeters to the nasal side of the disc. The tension was slightly reduced and slit-lamp examination showed holes in Descemet's membrane. The vitreous was clear except for a small hemorrhage to the nasal side. Vision was O.D. 20/20, O.S. 20/200.

It was decided to remove the steel by the giant magnet, using the diascleral route and Dr. Fisher had suggested that the point of incision in the sclera be coagulated before operation to avoid hemorrhage and subsequent detachment of the retina. Several Walker needles were used and a circle of coagulation was made around the point of incision. The steel was withdrawn from the eye through the scleral opening without any loss of blood or any bleeding in the vitreous. Vision two weeks following operation was 20/15.

It would appear that by this method foreign bodies can be removed from the vitreous without danger of profuse choroidal hemorrhage and postoperative retinal detachment.

Robert Von der Heydt.

SAINT LOUIS OPHTHALMIC SOCIETY

November 29, 1935

Dr. Meyer Wiener, president

Severe tuberculosis of the anterior segment of the eye in "parallel" pulmonary tuberculosis, four cases

Dr. E. V. L. Brown of Chicago (by invitation) gave a report on this subject which will be published in this Journal.

Discussion. Dr. William H. Luedde said that one could not stress the benefit derived from rest too greatly. One of his patients went to Colorado and saw the state from end to end. When she returned her condition was much worse than when she left. He evidently had not impressed on this patient the great necessity for rest.

Dr. John Green said that it had been his fortune to treat a number of cases of tuberculosis. It had been significant that most of those persons appeared to be in robust health. One particular case was in an individual from the West whose weight was 200 pounds. This patient had numerous nodules in the iris. Dr. Greene had had difficulty in getting an internist to coöperate in the use of tuberculin therapy. The lung was quiet. Personally he liked the Bullion Filtrate of Gay of Baltimore. This preparation could be better controlled than any other preparation.

Dr. Hayward Post said that two of his patients had been hospitalized. These had shown remarkable improvement under hospital care. They were not allowed to indulge in tasks that were exhaustive when permitted to return home. Some cases had done well on the use of tuberculin.

Dr. Brown (in closing) said in answer to Dr. Keller about cultures that in the first two cases there were negative cultures of the blood, but no one in the institution was specializing in culturing blood for tubercle bacilli.

In regard to the rest cure, he cited the case of a woman patient, a doctor's wife, who would not rest. The patient finally did have a period of five week's rest in California which was just enough to start her on the road to recovery.

He said that he had been unable to understand why there had been so many cases diagnosed as tubercular in Vienna, but it was probably due to the very poor living conditions of these people. The incidence is lower now because conditions have improved. There one saw many nodes in the iris which did not show under the slitlamp and a good many black spots which never showed on the surface of the iris.

Five hundred patients on the tuberculin treatment during 1924 and 1929 had improved; they came to the hospital for eight days, where they were given proper food. For several weeks they were given large doses of tuberculin twice a week. The patient was asked to stay in bed the day before the injection, the day of the injection, and the day after.

Dr. Tooker had asked about the food of these patients. One of the experts had stated that when a person developed tuberculosis, it was best not to send the patient to a sanitarium, but to keep him at home with home cooking of a kind that he liked and to which he was accustomed.

H. Rommel Hildreth,
Editor.

ROYAL SOCIETY OF MEDICINE, LONDON

Section of Ophthalmology

December 13, 1935

Mr. Ransom Pickard, president

Progressive external ophthalmoplegia in a case of myopathy

Mr. Purdon Martin presented a man aged 27 years, who had for seven years been aware of a drooping of the eyelids. The condition had recently become worse. The pupils reacted well to light, and apparently his accommodation was not impaired. There was also some muscular wasting in the facial muscles, the muscles of the neck, shoulder girdle, and upper arm. This wasting was most probably of the myopathic type, and it could be inferred that the ophthalmo-

plegia was also of that type. This patient had never shown any diplopia.

Retinal detachment

Mr. Montagu Hine showed a man, aged 52 years, whom he had first examined nine months previously. Two days ago his sight had failed while he was reading. Ten days before losing his sight he had struck his head against a door. Upon examination a large detachment had been discovered in the right eye and seven holes. A month later the exhibitor marked out and diathermized by Larsson's method a strip of sclera, 4 mm. broad, from the 11- to the 2:30-o'clock position. A current of 60 milliamperes was used for a total of 90 applications. Along the center of the strip 19 Safar punctures were made in order to let out the subretinal fluid and to seal the retina still further. The external rectus, the superior rectus, and the superior oblique muscles, instead of being divided, were raised on a hook. Subsequent to the operation the vision had improved to 6/18.

Retinal detachment following simple cataract extraction

Sir Richard Cruise showed a patient on whom a very satisfactory cataract extraction was carried out; later detachment occurred. The exhibitor had combined Safar's operation with trephining, with the result that whereas formerly there had been practically no fields, vision was now 6/12. He was still of the opinion, expressed in Edinburgh three years ago, that too many cases of detachment occurred subsequent to uncomplicated straightforward cataract extraction. The question was, he thought, worthy of special discussion. He considered that detachments were usually due to a rare form of retinitis which caused stretching, probably with cystic changes, and so ruptures were a predisposition.

(Reported by H. Dickinson).

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THE EYE IN SCULPTURE

As applied to representation of the human form, sculpture finds its greatest limitations in regard to the eye. Especially is this shortcoming noticeable in portrait sculpture.

A somewhat close analogy may be drawn between art and fashion, in that both often show on the one hand a disagreeable striving toward the merely novel and sensational, and on the other hand a curious affectation of reversion to the archaic and primitive.

During the Renaissance, and in some later periods, an excess of enthusiasm for the golden age of early Greek sculpture induced some sculptors to represent the eye in the form of a smooth oval prominence without detail, so that the practical effect was to give an impression of blindness. Thus, Feilchenfeld (Klinische Monatsblätter für Augenheilkunde, 1936, volume 96, page 382) points out that of eight busts standing in Rome on the road from the Pincio to the Villa Borghese, which have been made since the World War, three show "dead eyes." He feels that it is only an autosuggestive habit of acceptance that enables us to avoid being disagreeably impressed by the unnaturalness of this mode of representation, with its lack of expression, absence of "gaze," and lack of direction of gaze.

At the other extreme stand the florid attempts of some cultural periods, especially the degenerative period of late Roman art, to depict the eye in all its details by inserting precious stones and other materials or even by actual painting. The doctrine of artistic unity, of complete representation of the subject in a single chosen material, severely condemns such hybrid efforts.

It has been argued that the sculptor ought to attempt plastic rendering only of details which may be realized by the palpating finger. Muscle and bone may be felt beneath the skin, but not the play of color which makes of the eyeball a

living thing. Yet to leave the eye expressionless is to rob portraiture of its highest spirituality.

Since very early times there have been sculptors who recognized the necessity of finding means by which to represent the force of the living eye. Suggestive coloring was followed by careful painting of ocular details. The transition from stone to bronze led to finer chiseling of outlines to indicate the pupil, and it even became customary to insert artificial eyes in holes left in the bronze shell. By variations in curvature the attempt was made to delineate cornea, iris, and pupil. About four hundred years before Christ the Greek sculptors learned that expression might be enhanced by emphasis on shading beneath the upper lids, upon frontal furrows, and upon eyebrow detail.

Some exponents of austere simplicity have argued that the chiseled pupillary impressions found in Roman copies of Greek statuary are merely spurious embellishments of the originals. But Feilchenfeld adduces abundant evidence to support the contention that even colored representation of the eyeball was the rule rather than the exception among the archaic and classical Greeks.

In spite of the assumption, general during the Renaissance, that the Greek classic principle was opposed to ocular detail, chiseled representation of iris and pupil may be found in numerous works of Donatello, Settignano, Verrocchio and Michelangelo. Several hundred years later, Winckelmann and other archeologists called attention to the polychromia of Greek sculpture; and chiseling out to suggest the eye is now again recognized as good practice, although not universally adopted. It appears characteristically as a deep depression taking the place of cornea, iris, and pupil, with other incidental but variable details such as an incomplete circular groove to simulate the corneal light reflex.

Extreme opinions notwithstanding, the majority of cultured persons fail to find pleasure in forms of plastic art which lack contact with reality. To most of us it will seem that the eye, the "window of the soul," should play an expressive rather than a mute part in sculptured human features.

W. H. Crisp.

THE A.M.A. IN KANSAS CITY

Missouri put on her best behavior for the seven thousand physicians who invaded her from all parts of the United States during the week of May 10th. The weather was clear and cool. This is mentioned first because it is a vital factor in the success or failure of a meeting. The A.M.A. has wisely selected the most beautiful months of the year for meetings; winter past and spring not yet turned into the heat of summer.

Having been a trifle slow in making a reservation, our room assignment for the first night was not all that might be desired. At least we learned what room with a "half bath" meant. Let the unwary be advised that this does not denote a shower or a shared bathroom, but a bathroom without a bath. Let me pass quickly over the comments on insufficient rooming facilities, for it was the only drawback to one of our best meetings. The truth of the matter is that there are only a few cities in our country that have adequate facilities for housing from five to ten thousand visitors in good hotel rooms. Kansas City made up for its lack by the courtesy with which the local physicians extended the hospitality of their homes to the out-of-town doctors.

Early Monday morning saw some thirty members and assistants of the American Board of Ophthalmology gathered at breakfast for instructions concerning the examination, which was held immediately afterwards at the Kansas City General Hospital. Thirty-six candidates presented themselves. From year to year there seems to be a gradual improvement in the caliber of these, but there is still much to be done. The value of certification is now proved beyond question. Twelve special boards have followed the lead of the ophthalmologists and are either already formed or in the process of formation.

One new feature this year was the submission of tentative questions for

the examiner's use by several board members. This gave the assistants, to many of whom the work was new, an idea of the type of question to ask and a general indication of the extent of the knowledge expected in the candidate. This practice could be carried further to advantage, and more questions accumulated and sent to the prospective examiners a few weeks in advance of the examination.

Tuesday, Research Association day, witnessed the presentation of eight excellent papers. It is most stimulating to be given a glimpse into the laboratories of our leading institutions whence emanate many of these papers. Chemistry and immunology are still apparently preponderant in the research departments although the program showed a good variety of subject matter. The existence of the Research Association seemed justified from a critical analysis of these theses, but this matter will be considered more fully in another editorial.

Dr. A. B. Reese of New York City replaced Dr. William L. Benedict, whose term as Trustee expired. The number of commissioners was kept about the same, a few substitutions for those who had been inactive being made. There was a large attendance. The organization grows yearly.

Through the courtesy of the Kansas City Union Electric Light and Power Company, their very beautiful and modern auditorium was available for the meetings of both the Research Association and of the Section. Air cooled to perfection, well illuminated, with splendid acoustics and comfortable chairs, it was the most perfect place for meeting that we have ever seen.

The program was excellent, a tribute to our able officers. A new feature was the formal presentation of instruments and appliances. This was an improvement on the old informal method. Possibly it would have been better had it been held on the first instead of the second day, because these demonstrations served as splendid introductions to the exhibits, which could be appreciated much more after the explanations. This leads us to mention and praise most highly the best General Scientific Exhibit the Section has ever had. Congratulations to the committee! Excellent moving pictures of operations, far too popular for the space allotted for observers; beautiful colored and black-and-white plates and drawings of ocular pathology; embryological specimens; illustrations of malformations; photographs of the eyes, and many other interesting subjects were shown.

It is to be hoped that this feature will become of increasing prominence, for it is most instructive, and when all is said, instruction remains the greatest contribution of any scientific meeting.

For the next year Dr. William L. Benedict was chosen chairman and Atlantic City again as the location. No one is more deserving of the office than the nominee, for there is no one who has worked harder for ophthalmology nor striven more to raise its standards. Under his guidance the Section meeting in Atlantic City should reach a new high in excellence.

Lawrence T. Post.

OBITUARY

William Holland Wilmer, 1863-1936

Dr. Wilmer was born in Powhatan County, west of Richmond, Virginia, on August 26, 1863. He was the son of the Rev. Richard Hooker Wilmer, subsequently Bishop of the Protestant Episcopal Church. Dr. Wilmer studied medicine and received his medical degree at the University of Virginia, in 1885. He then went to New York, serving as interne in Mt. Sinai Hospital; and for two years was office assistant to Dr. Emil Gruening. In 1889 he entered practice in Washington, D.C., and in 1897 was active in the organization of the Episcopal Eye, Ear and Throat Hospital. He became Professor of Ophthalmology in Georgetown University in 1906. In 1917 he was made Major in the Medical Corps of the U. S. Army, and was placed in charge of the Research Laboratory for Air Service at Mineola, L.I., where important studies were made regarding visual requirements for aviation. For his

scientific and administrative achievements in this service he was made Brigadier General in the Medical Reserve Corps.

Dr. Wilmer's fine intelligence, high courtesy, kindly sympathy surgical skill, and devotion to his patients' welfare made him a wide circle of warm friends among those who lived in or visited the Nation's capital. One of his patients, a woman of bright mind and wide acquaintance, coming to understand his desire to render the best service to the largest circle of patients, formed a group which determined to give him the best facilities and opportunities for his professional work. He refused to give any assistance toward an appeal to his patients, or to help in carrying out such a plan. But the determination of the originator, her wide acquaintance, and persuasive way of presenting her ideas secured the support of Johns Hopkins University and the Rockefeller Foundation; and the needed funds were raised to build and endow the Wilmer Ophthalmological Institute of the Johns Hopkins University and Hospital.

Without waiting for the buildings planned for the Institute, Dr. Wilmer in 1927 gave up his practice in Washington, went to Baltimore, and started to organize and direct his institution. He went to Europe and studied its great ophthalmic hospitals. In 1927 he started his work in temporary quarters, and on October 15 and 16, 1929, the Institute was formally opened with historic and scientific addresses by Professor Ernst Fuchs of Vienna, Dr. George E. deSchweinitz of Philadelphia, and Sir John Herbert Parsons of London. During the ensuing years the Wilmer Institute took a leading place among the ophthalmological institutions of the world. Last year, when he reached the retiring age for professors in the university, Dr. Wilmer went back to his home, remaining in practice in Washington. As was said at the dedication of the Institute, Dr. Wilmer started out "determined that he should practice his profession in his chosen specialty for the benefit of those who were suffering, without regard to their wealth or social position, or the compensation which he might receive." After his death his assistant said: "For him money meant nothing. That was his secret as a great surgeon. There are many surgeons who are skilled with their fingers. He was skilled with his heart. Even when the totally blind came to him—and he could give them no hope—they always left feeling a little better, and feeling that there was something to live for."

There is something in medicine greater than modern science and technical skill. Dr. Wilmer had these in very high degree; but he had something more. He added service to human beings. He understood its importance and steadily kept it his main objective. This was the secret of his power and his success. A woman who took her sister to him for bilateral cataract operations, and who, on the day before he died saw him for a final checking of results wrote: "No words can express our gratitude to Dr. Wilmer for his great kindness to both of us."

His was a balanced character. He was the same to a negro woman in his clinic, or the British nobleman, or French ambassador, to Charles Lindbergh, or the King of Siam.

He died suddenly of a heart attack on Thursday, March 12, 1936; and his burial, on March 15th, was in the grounds of the Washington Cathedral, of which he had been a warden since 1915. The Distinguished Service Medal, awarded to him in 1919, and the Cross of a Commander of the Legion of Honor of France, which came in 1924, were appropriate recognitions of the respect and honor with which he was universally regarded.

Dr. Wilmer was not a prolific writer, but all he wrote was wise and true. His Atlas Fundus Oculi represented the opportunity afforded by the Institute and the coöperation of associates. But its broad conception, its interest and usefulness for the general profession, the sound judgment shown in the selection of material represent William H. Wilmer. His honorary degrees and memberships in many societies, indicate the respect in which he was held by his colleagues.

Edward Jackson.

BOOK NOTICES

Strabismus. By Doctors Cantonnet and Filliozat. Translated from the French by Dr. Max Coque. Cloth bound, 379 pages, 192 illustrations. Published by M. Wiseman & Co., London, England. Price $8.00.

This is the most comprehensive work that is devoted entirely to the study and correction of strabismus by orthoptic methods. The authors have had extensive experience in this particlar field, Dr. Cantonnet as director of, and Dr. Filliozat as assistant in, the Albert Remy School of (Squint) Reëducation in Paris, France. Contrary to the general views held in this country the authors deprecate surgical intervention in strabismus except in a relatively small number of cases and even then largely as an aid to orthoptic training. They base this rather unorthodox view on the results they have obtained in their reëducation schools and claim that 70 percent of squinters can be reëducated.

The book starts out with a study of the physiology of binocular vision, discussing briefly but adequately the development of fusion, stereopsis, and so forth. The authors advance the interesting hypothesis that fusion is a graded process, having its maximum intensity at the two foveas and gradually diminishing to the periphery of the common field. Following this is a lengthy discussion with many illustrations of various tests for binocular vision. Many of the devices used for testing as well as for training are of French design and practically unknown here. Fortunately, in contrast to the elaborate and expensive instruments of English and American make, their instruments are rather simple and inexpensive. Their phenomenal success with these simple devices corroborates the opinion held by the best workers in this field, that in orthopedic training much more depends upon the skill of the doctor who gives the training than upon the devices used.

A considerable portion of the book is taken up with discussions stressing the role of the "directing eye" both in normal binocular vision and in strabismus. The authors analyze the state of binocular vision in isometropia and in anisometropia with and without the presence of a "directing eye." They distinguish between a "true" directing eye, a "false" directing eye, an "acquired" directing eye, etc. They further make a distinction between the "directing eye" and the "predominant or prevalent eye." But this distinction as well as much of the analysis of this phase of vision is somewhat obscure. The directing eye from their viewpoint is the eye with the higher central acuity, and they claim that it is always along the axis of this eye that the combined images are exteriorized. For reasons not at all convincing to the reviewer they reject the usually accepted phrase of images being "projected" into space and prefer the term "exteriorized."

Under the heading of the "Pathology of binocular vision" the authors present among the well-known disturbances of binocular vision a heretofore undiscovered anomaly which Dr. Cantonnet has termed, "Binocular instability." He claims that it is extremely frequent and very troublesome. He defines it as "Uncertainty in the collaboration of the vision of the two eyes," and outlines the symptoms, diagnosis, varieties, treatment, and prognosis of this anomaly.

This covers about half of the book, the second half being devoted to the methods of reëducating the convergent and divergent strabismics, including the treatment of amblyopia and removal of suppression. Among the methods, much is made of a method original with Dr. Cantonnet and termed the "mental effort." The convergent strabismic is encouraged to think of a distant object high above the horizon—this tending to produce a divergence of the eyes. The divergent strabismic is encouraged and taught to think of a near object below the level of the horizon, this tending to develop convergence. The authors claim remarkable success from this form of training; for example, one patient, aged 17 years, with a squint of 33 degrees in the right eye, had apparently by this method alone diminished

his squint in five months to only 2 degrees, and in three more months the squint was cured completely. One may stop here a moment to call attention to the very small amounts of squint mentioned by the authors; e.g., a squint of two degrees or even of one degree. What is *apparently* referred to in the book is an actual squint, a permanent deviation not a heterophoria. The latter of course can be measured even to a fraction of a degree. But some will question the measurement and the fact of an actual squint of 1 or 2 degrees which required orthoptic treatment to remove it. I emphasized "apparently" because it is sometimes difficult to follow the discussions, since the authors' definitions and uses of the terms squint, true strabismus, false strabismus, manifest strabismus, latent strabismus, heterophoria, etc., leave much to be desired.

The authors' emphasis on the "mental effort" would naturally lead them to prefer reëducating adults rather than children, and in fact they claim that orthoptic training is far better and more efficient with adults, say, up to the age of 40 years, than with children under six or seven. In this they radically differ with Worth, who claims that orthoptic training after the age of six or seven years is useless. But they do agree with Worth in the importance of the fusion faculty and say, "to restore the fusion function is to attack the essential cause of the strabismus."

Amongst the concluding observations one will be greatly impressed with one series of case records especially. These state the ametropia found in each eye and the correction which was given and which produced comfortable binocular vision. Let us mention just a few of the fifty cases cited. For example, case 2. Patient requires R. E. + .75 D. sph., L. E. + .50 D. sph., but gets binocular comfort only with O. U. + .50 D. sph. Or case 3. Patient requires R. E. + 1.00 D. sph. ⊂⊃ + 1.00 D. cyl. ax. 90°; L. E. emmetropic; the presbyopic add is + 1.75 D. sph. He gets comfort only with O. U. + 1.75 D. sph. Or case 4. Patient requires R. E. — 6.00 D. sph., L. E. — 6.50 D. sph. He gets comfort only with O. U. — 6.00 D. sph. Or case 7. Patient requires R. E. + .50 D. sph. ⊂⊃ + .50 D. cyl. ax. 90°; L. E. + .50 D. sph. ⊂⊃ + .75 D. cyl. ax. 90°, but gets comfort only with O. U. + 1.50 D. sph. for reading. Finally, case 9. Patient requires R. E. — 1.25 D. sph. L. E. — 3.0 D. sph. ⊂⊃ — 1.00 D. cyl. ax. 165°. He is most comfortable with O. U. — 1.25 D. sph.

If this be so, one might seriously question the usefulness of our modern finesse in examining and correcting ametropia to the last eighth of a diopter and maneuvering the accuracy of the cylinder axis to exactly 88 degrees and not 90 degrees. One of the chief objections to the ready-made spectacles sold over the counter in the 5 and 10c stores was that they contained no cylinders and carried spherical lenses of equal power for the two eyes. But this seems to be more a virtue than a defect. Those impressed with the seriousness of aniseikonia before and after correction as a source of discomfort will be especially puzzled by these case records.

This may be a good place to close the review because the above-mentioned observations are not the only portions of the book which will arouse serious questioning. In fact, perhaps the chief merit of the book is that it is stimulating and challenging. It is not an easy book to read and follow—one must "work" on it to get his reward, and the reward will consist not only in the acquisition of new facts and new techniques but in being more or less forced to think things through.

Among the lesser shortcomings of the book may be mentioned its lack of an index, the more than usual number of "slips of tongue" as well as "slips of pen," the recording of visual acuity in a variety of fractions, the lack of precision and consistency in many of the definitions, and the lack of clarity in many passages. The latter may be due to infelicities in the translation, as the translator unfortunately died just before the book was published. Innocent slips of translation, such as, e.g., a "vice" of refraction instead of an error of refraction do not obscure the thought

presented, but others probably do. However, with all these faults the book is by far the best and most stimulating treatise on orthoptic training in the English language. It is especially welcome since the field is so large and the available authoritative literary contributions on the subject so few.

Joseph I. Pascal.

Allergy of the nose and paranasal sinuses. By French K. Hansel. Published by the C. V. Mosby Co., St. Louis, 1936. Cloth covers, 820 pages, 58 text and 3 color plates, price $10.00.

Quite obviously the bulk of this excellent treatise is devoted to nasal subjects and only a small part (25 pages) to allergy in opthalmology. This chapter is, however, very well done, although in no sense comparable to the monograph of Alan C. Woods which was published in 1933. On the other hand, it does introduce a few ideas that have been advanced since the publication of the latter book.

An extensive bibliography of 130 references is given.

Those ophthalmologists who also practice otolaryngology and have access to this book will find this chapter an interesting one.

The first chapters of the book apply to allergy in general and give a splendid discussion of this phenomenon.

Lawrence T. Post.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Opthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, history
19. Anatomy, embryology, and comparative ophthalmology

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1. GENERAL METHODS OF DIAGNOSIS

Bane, W. C. **Photography of the eye for case-record purposes.** Amer. Jour. Ophth., 1936, v. 19, March, pp. 241-244.

Beresinskaja, D. I., and Plastinin, H. B. **A device to replace Ulbrich's drum for measuring the depth of the anterior chamber.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 525.

The chief object is to do away with the necessity of buying the foreign made Ulbrich drum. (Illustration.)

Ray K. Daily.

Borsellino, G. **The light sense in arteriosclerotics and in malaria patients.** Arch. di Ottal., 1935, v. 42, July-Aug., p. 199.

Observations on malarial patients show the light sense to be normal in about one third of the cases studied and definitely decreased in all other cases. The functional disturbance of the retina is explained on the basis of blood alterations, infarcts by parasites, hemorrhages, and toxic factors.

H. D. Scarney.

Cowan, Alfred. **The schematic eye.** Arch. of Ophth., 1936, v. 15, Feb., pp. 312-319.

The author discusses the refracting powers and linear measurements of Gullstrand's exact schematic eye and the simplified schematic eye. These values are also compared with those of Tscherning and Helmholtz.

J. Hewitt Judd.

Dekking, H. M. **The measurement of opacities in the eye.** Graefe's Arch., 1936, v. 135, p. 90.

The author describes his instrument for accurately estimating the density of an opacity in the cornea or lens. Opportunity is then afforded for comparing the density of an opacity at different times and so estimating increase or decrease. Two beams of light laterally separated by an angle of 70 degrees are projected by the instrument into the cornea and lens. These rays reflected from the eye directly anteriorly are viewed through an eye piece in the instrument and compared with a source of light varied to a definite degree. H. D. Lamb.

Duggan, J. N. **A visual acuity test for malingerers.** Brit. Jour. Ophth., 1936, v. 20, March, p. 175.

This apparatus is an illuminated box, the face of which is divided into four rectangles, two containing green, one red, and one white glass. In front of this is placed one of a series of five metal sheets in which are apertures so arranged that by varying the way in which it is placed before the colored squares as many as four different variations of

aperture position are possible. In all, 21 variations may be quickly made. The apertures range in size from 6/24 to 6/6 Snellen. D. F. Harbridge.

Fleischer, B. **The diagnosis of hereditary blindness.** Deut. Med. Woch., 1936, no. 4, Jan. 24, p. 143.

To diagnose hereditary blindness one must have extensive knowledge of the pathology of ocular disease and the possibilities as to inheritance. He lists the following diseases as being hereditary: ptosis, ophthalmoplegia, nystagmus, familial corneal degeneration, keratoconus, lens opacities, ectopia lentis, aniridia, colobomata, microphthalmos, cryptophthalmos, anophthalmos, albinism, hemeralopia, pigmentary degeneration of the retina, amaurotic idiocy, familial macular degeneration, total color blindness, glioma, retinal detachment, Leber's atrophy, and hydrophthalmos. Theodore M. Shapira.

Inouye, Tatsuji. **Large visual-test charts with hooks for determining vision down to 0.02 at 5 meters.** Klin. M. f. Augenh., 1935, v. 95, Dec., p. 750. (Ill.)

Inouye reduced the thickness of the lines of Snellen's test types to dimensions based on a 2/3-minute angle, which in a theoretical discussion he claims is scientifically more accurate. At 5 meters, vision as low as 0.02 or 5/250, corresponding to counting fingers at one meter, can be measured with the enlarged white chart, and for patients sensitive to light a black chart with white hooks is used. A hook 5 mm. wide with 1 mm. thickness of lines corresponds at a five-meter distance to V = 1. C. Zimmermann.

Ješe, L. **Proof of simulation and aggravation of unilateral amblyopia.** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 71.

After careful objective examination, Ješe begins by testing the better eye, both eyes being open. At every insertion of lenses the trial frame is removed and speedily replaced. The lenses are always changed on both sides, as the patient may observe, but he is prevented from looking at the test chart by interposition of the surgeon's head. Plus 8 or 10 is placed before the poor eye, plus 0.5 to 1.00 before the better eye, with slight changes in three or four tests. Thus the vision and refraction of the good eye are ascertained. For testing the poor eye the refractive power of the lenses before it is gradually diminished while that before the good eye is increased. After about five changes the patient has a plane or correcting lens before the poor eye and plus 8 or 10 D. before the better eye. Thus without knowing it the patient indicates the vision of the poor eye with and without glasses. During the tests the surgeon refrains from remarks, and to the end of the examination the patient remains unaware of the examiner's opinion. C. Zimmermann.

Kiseleva, E. H. **Melano-flocculation reaction in ophthalmology.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 869.

By analysis of 26 cases it is shown that this serologic test for malaria is helpful but not absolute in establishing the etiology of ocular disease.

Ray K. Daily.

Kogan, K. S. **Pickard test for depth perception.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 913.

From a tabulated report of 36 examinations the author finds the test particularly useful in selection of aviators, because it gives a quantitative estimate of the deficiency in binocular vision.

Ray K. Daily.

Krol, A. G. **A lamp for illumination of the operative field and for transillumination of the eye.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 955.

For Fuchs's lamp, the author recommends the use of a globe manufactured in Russia for the slitlamp.

Ray K. Daily.

Lipovich, H. C. and Sher, A. I. **Construction of charts for testing visual acuity.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 926.

A chart with a device for exposing one letter at a time eliminates the possibility of a patient memorizing lines of letters, and deprives malingerers of the

opportunity to judge the relative size of test letters. Ray K. Daily.

Machlin, I. M. **Studies in twilight vision.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 917.

The author tested the dark adaptation of fifty people with the apparatus of Kravkov-Vishnevskii. Five persons found to have disturbances in dark adaptation were tested in an open field at ten o'clock at night. Objects were placed at various places in the field and the test person was asked to run at the rate of one hundred meters per minute and mark the objects. Persons found to have deficient dark adaptation in the laboratory stumbled or fell in the open field. The author urges such examination in vocational tests for air pilots, chauffeurs, transport engineers, and so on.
Ray K. Daily.

Poos, F., and Grosse-Schönepauck, H. **Studies on the fixed pupil. Communication I. The fixed pupil as a test object in pharmacology.** Graefe's Arch., 1936, v. 135, p. 144.

In some of the rabbits the optic papilla was destroyed by insertion through the sclera of the point of a needle under direction of the ophthalmoscope, causing electrocoagulation with a high frequency current. In other rabbits, amaurosis was produced by diascleral abrasion with a small sharp spoon, causing complete destruction of the papilla and of an extensive expanse of the surrounding retina. The fixed pupil of rabbits after these operations measured on an average 7.6 mm. By the regular curves obtained with the fixed pupil, after instillation of adrenalin 1 to 1000, cocaine 2 percent, atropin 1 percent, pilocarpin 1 percent, or eserin 1 to 5000 (in contradistinction to the lack of uniformity with the normal eye), the author clearly shows the truth of his contention that the experimental fixed pupil is a valuable test object in pharmacology. H. D. Lamb.

Sergeev, H. V. **A device for determining visual acuity.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 527.

This is a device for malingerers. (Illustrations.) Ray K. Daily.

Yater, W. M. **The value of ophthalmoscopic examination in the diagnosis of systemic diseases.** Amer. Jour. Ophth., 1936, v. 19, April, pp. 302-306.

2. THERAPEUTICS AND OPERATIONS

Dejean, C. **New procedures in anesthesia and elective paralysis of different nerves and muscles of the orbit.** Arch. d'Opht., 1936, v. 52, Jan., p. 32.

The author describes in much detail his methods of selective anesthesia for ocular and lid muscles. His technique has been evolved after many experiments on the cadaver regarding (1) amount of anesthesia necessary to affect a nerve ending supplying a particular muscle, (2) the exact direction and distance of the penetrating needle. The article, full of anatomical details, does not lend itself to abstracting. (Illustrations.) Derrick Vail.

Gimenez Canovas. **Ocular tuberculosis and its treatment with the immunizing bodies of Spengler.** Arch. de Oft. Hisp-Amer., 1935, v. 35, Oct., pp. 533-551.

The author has used the immunizing bodies of Spengler with encouraging results in tuberculous eye conditions. These bodies are contained in the red cells of animals which have been immunized against infection. For treatment of tuberculosis, a slightly acid extract is prepared with the blood of rabbits immunized against this disease. The extract is injected at intervals of from five to ten days, beginning with very low dilutions. The immunizing bodies of Spengler act by lysis, slowly destroying the tubercle bacilli. (Bibliography.) R. Castroviejo.

Herrenschwand, F. **The use of pantocain in ophthalmology.** Wien. med. Woch., 1936, no. 6, Feb. 8, p. 164.

The author lists the following as advantages of pantocain over cocaine in the eye: no dilation of the pupil, no disturbance of accommodation, no increase in tension, no injury to corneal epithelium, longer action, less expensive.
Theodore M. Shapira.

Kravitz, Daniel. **Postoperative endogenous infections of the eye.** Amer. Jour. Ophth., 1936, v. 19, April, pp. 328-330.

Macht, D. I. **A phytopharmacological approach to some ophthalmological problems.** Amer. Jour. Ophth., 1936, v. 19, April, pp. 324-327.

Pletneva, H. A., and Fradkin, M. I. **Novocaine blockade in ocular practice.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 817.

Experience with 31 patients demonstrates that a pararenal novocaine blockade is a harmless procedure which is more effective than blockade of the superior cervical ganglion. It acted best in acute cases, in most of which it relieved the subjective symptoms. In glaucoma it was entirely ineffectual.

Ray K. Daily.

Promtov, A. A. **A substitute for holocaine and cocaine.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 842.

Tiocain, an anesthetic manufactured in Russia, is chemically novocaine in which one atom of oxygen has been replaced by one atom of sulphur. Study to determine the action of tiocain shows that it is superior to holocaine in being soluble in cold water, in being less toxic, and in affording a longer anesthesia. As compared with cocaine it acts more rapidly, is less toxic, is more stable in solution, does not dilate the pupil, does not raise intraocular tension, and does not exfoliate corneal epithelium.

Ray K. Daily.

Rossi, G. **Further researches concerning the influence of testicular extract on penetration of drugs into the interior of the eye.** Arch. di Ottal., 1935, v. 42, July-Aug., p. 225.

Rabbits were used. Solutions of various concentrations of sodium salicylate and potassium sulphocyanide were instilled in the conjunctival sac after instillation of testicular extract. An increase in permeability of the corneal membranes to the solutions was found.

H. D. Scarney.

Scheerer, Richard. **Physico-dietetic treatment in the sense of nature therapy in eye patients.** Klin. M. f. Augenh., 1935, v. 95, Dec., p. 738.

The methods are described, with their beneficial influence on eye affections in combination with the necessary local treatment. (Case reports.)

C. Zimmermann.

Selinger, Elias. **Local quinine therapy for some diseases of the conjunctiva and cornea.** Arch. of Ophth., 1936, v. 15, Jan., pp. 31-35.

Quinine applied locally to the mucous membrane penetrates the epithelium and destroys leucocytes, lymphocytes, and other cellular elements and inhibits invasion of the tissues by these cells. It is a bactericide, astringent, and mild anesthetic. When applied as a ten percent aqueous solution or two or four percent ointment it has given good results in trachoma, interstitial keratitis, disciform keratitis, and old corneal opacities.

J. Hewitt Judd.

Swett, W. F. **Hyperpyrexia following the use of atropin in the eyes of children.** Amer. Jour. Ophth., 1936, v. 19, March, pp. 247-248.

Verhoeff, F. H. **A new needle-holder for ophthalmic and other delicate surgery.** Arch. of Ophth., 1936, v. 15, Jan., pp. 111-112.

This instrument employs a new principle in which pressure is applied to the needle by means of a cone wedging into a tube. The cone is at the end of a plunger which slides in the tube, the end of which is notched to receive the needles. The details of construction are shown by photographs.

J. Hewitt Judd.

Volokonenko, A. I., and Shamuilov, B. H. **A substitute for American vaseline.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 531.

The author found that "compound fat," an intermediate product in the manufacture of margarine, was very satisfactory as a basis for eye ointments, and he recommends it as an in-

expensive substitute for American vaseline. Ray K. Daily.

Wiedersheim, O. **Congestion and massage treatment of the eye.** Klin. M. f. Augenh., 1935, v. 95, Dec., p. 790. (Ill.)

A pipette with an opening of from 8 to 10 mm. is placed directly on the eyeball, and massage is effected by alternate suction and pressure. The cupping action sometimes produces hemorrhages, which the author thinks act like autohemotherapy. The method proved useful in phlyctenules, parenchymatous keratitis, and corneal ulcers, and might be beneficial in recent embolism of the central retinal artery.

C. Zimmermann.

3. PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Bazshenova, M. A. **Myopic fundus changes in a nonmyopic eye.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 533.

A seamstress, 28 years of age, complaining of impairment of vision, was found to have a myopic conus and a central chorioretinitis without a high myopic refractive error. Ophthalmometric study of the eyes demonstrated that the emmetropia was the product of a long axis and a flat cornea.

Ray K. Daily.

Cholina, A. A., and Chernobilskaja, P. I. **The measure of ocular fatigue.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 682.

A study of the effect of school work made at the beginning of the day and following each period and plotted on a curve showed a primary rise and secondary diminution in visual acuity and accommodation. A test of these functions immediately following one hour of reading demonstrated a diminution in visual acuity and a rise in accommodation. To clear up these contradictory findings the author made a laboratory study of seven students. The tabulated findings show that accommodation rises during work until it reaches its maximum, stays there during the work, and falls rapidly five minutes after the work is over. The increase in amplitude of accommodation in response to demand is ascribed to the plastic tone of smooth muscle. The contradictory findings of school and laboratory are explained by the fact that at school the ciliary muscle is tested under conditions of periodic contraction and relaxation, while in the laboratory it is tested after prolonged tonic contraction. Apparently periodic contraction and relaxation lead to ciliary fatigue. Visual acuity gradually diminishes with visual work, but rises to its original height after a five-minute rest period. Visual acuity also diminishes (in the test subjects) after mental mathematic work, which shows that visual acuity diminishes not only with visual, but also with mental strain. Ray K. Daily.

Cholina and Makulski. **The measure of ocular fatigue.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 506.

This detailed report on maintenance of clear vision and visual attention confirms the authors' former conclusions that the findings of Ferree and Rand on ocular fatigue reflect periodic variations in processes in the central nervous system, and that the maintenance of clear vision is not a criterion of ocular fatigue. Ray K. Daily.

Danzig, H. M. **The effect of bright light on the ocular adaptation.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 516.

A tabulated report shows that the intense light of vacuum bulbs causes functional but not organic disturbances. Disturbances in adaptation are most apparent, last longest, and may be of peripheral or central origin. The dazzling effect depends on the length of exposure. Momentary action causes a disagreeable sensation in addition to the disturbance in adaptation. After prolonged exposure the eye grows accustomed to the intensity but adaptation remains disturbed. Ray K. Daily.

Ferree, C. E., and Rand, G. **The use of variable illumination in the correction of the presbyopic eye.** Amer. Jour. Ophth., 1936, v. 19, March, pp. 238-240.

Kisin, P. E. **A laboratory study of one hundred color-blind machinists.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 688.

The object of the study was to determine whether color-blind railroad people with years of experience could be relied upon to distinguish signals by their saturation and intensity. Experience in the service does not increase ability to recognize signals. Training may increase ability to distinguish between constant degrees of saturation and intensity, but with variation in these factors the influence of experience disappears. There is a relation between the number of mistakes and the type of color anomaly; the protanopes making the largest number of mistakes and the protanomalous the least. Those who fail with the isochromatic tests usually fail also with the transport tests. Ray K. Daily.

Lauber, Jan. **Lenses manufactured in Poland.** Klinika Oczna, 1935, v. 13, pt. 2, p. 269.

In a comparative examination of Zeiss Punktal lenses with Ultral lenses manufactured in Poland, Lauber shows that lenses of Polish manufacture are as good as the Punktal lenses and he urges local ophthalmologists to prescribe them. (Illustrations.)

Ray K. Daily.

Levinsohn, G. **Reply to criticisms of my theory on the genesis of myopia.** Arch. of Ophth., 1936, v. 15, Jan., pp. 84-85.

The difference in the resistance of the coats of the eye to gravity in different individuals is given as explanation why displacement of gravity does not cause all eyes to become myopic, why one eye becomes more myopic than the other, and why the percentage of myopes is not greater in those professions requiring great bending of the body and head.

J. Hewitt Judd.

Ludvigh, E. J. **Aniseikonia.** Amer. Jour. Ophth., 1936, v. 19, April, pp. 292-301.

Luedde, W. H. **Lenticular accommodation.** Amer. Jour. Ophth., 1936, v. 19, March, pp. 245-247.

Post. M. H. **New and practical charts and lighting for testing visual acuity and locating the astigmatic axis: simple, standardized, and complying with modern requirements.** Amer. Jour. Ophth., 1936, v. 19, March, pp. 222-228; also Trans. Amer. Ophth. Soc., 1935, v. 33, p. 114.

Samsonowa, V. G. **The influence of the form of the object on stereoscopic vision.** Graefe's Arch., 1936, v. 135, p. 30.

The threshold of stereoscopic vision is the minimal difference in depth of objects which is noted by the observer and is expressed in degrees. It was found by experiment that the threshold of stereoscopic vision diminished rapidly with increase in the ratio of the vertical dimension of the object to the horizontal. The greatest difference occurs with change of the ratio from 2 to 0.07: In this interval the threshold differs between 8 and 15.9 inches. The number of tips of the object as well as the size of its area does not influence the threshold of stereoscopic vision as long as its circumference and angular dimensions remain constant. H. D. Lamb.

Sherman, A. R. **Some practical observations concerning ophthalmic lenses.** Jour. Med. Soc. New Jersey, 1935, v. 32, May, p. 282.

This paper attempts to explain the part played by spectacle lenses in correction of errors of refraction. Details considered are: distance of lens from eye, shape of lens, prism effect of decentration, and astigmatism of oblique pencils. Theodore M. Shapira.

Sundqvist, M. **A new theory of anastigmatic spectacle lenses critically examined.** Graefe's Arch., 1936, v. 135, p. 67.

In July, 1934, Ostwalt published a new theory of anastigmatic spectacle lenses, rejecting a theory which had prevailed for twenty years and is here called the classical one. The new theory of Ostwalt is fundamentally false, the classical one correct. The author reviews at length the formulae of the two theories. H. D. Lamb.

Szymanowski, Kazimierz. **The correction of vision in children.** Klinika Oczna, 1935, v. 13, pt. 2, p. 468.

This is an enumeration of the causes of defective vision and a plea for conservation of vision by prompt institution of the indicated surgical, orthoptic, or therapeutic procedures.

Ray K. Daily.

Trantas. **On velonoscopy.** Zeit. f. Augenh., 1936, v. 88, Feb., p. 230.

In this answer to Krämer's criticism (see Amer. Jour. Ophth., 1935, v. 18, p. 777), Trantas describes the history of the development of velonoscopy, its technique, and its relation to other methods of refraction which are similar in whole or in part. He argues that there are essential differences between velonoscopy and other methods and that he is justified in claiming priority for an invention to the development of which his work was a considerable contribution.

F. Herbert Haessler.

Wright, W. D. **Intensity discrimination and its relation to the adaptation of the eye.** Jour. of Physiology, 1935, v. 83, March 15, p. 466.

Experimental evidence is given to prove that the adaptation of the eye does not play any appreciable part in the discrimination of just noticeable differences in brightness.

Edna M. Reynolds.

4. OCULAR MOVEMENTS

Berens, Conrad. **A six-meter recording stereoscope.** Amer. Jour. Ophth., 1936, v. 19, April, pp. 331-332; also Trans. Amer. Acad. of Ophth. and Otolaryng., 1935, 40th annual meeting, p. 414.

Fine, A. **Oculomotor nerve spasm in Gradenigo's syndrome.** Arch. of Otolaryng., 1935, v. 21, Feb., p. 142.

Fine says that the third nerve is infrequently involved in Gradenigo's syndrome by pressure at the base of the skull. Spasm of the homolateral internal rectus arises as a result of disturbance of innervation to the eye muscles secondary to paralysis of the sixth nerve.

Theodore M. Shapira.

Friedenwald, J. S. **Diagnosis and treatment of anisophoria.** Arch. of Ophth., 1936, v. 15, Feb., pp. 283-307.

Anisophoria is the condition in which the degree of muscular imbalance varies with the direction of gaze. The author describes his instruments and method of measuring the anisophoria. Three methods for its correction are described; the use of segments of prisms, displacement of reading matter toward the side of the eye which has the greater rotational amplitude, and magnification of the image for the eye which has the greater rotational amplitude. (Discussion.)

J. Hewitt Judd.

Gellhorn, E., and Spiesman, I. **The influence of hyperpnea and of variations in the oxygen and carbon-dioxide tension in the inspired air upon nystagmus.** Amer. Jour. Physiology, 1935, v. 112, Aug., p. 662.

The authors studied the effect of carbon-dioxide excess, of carbon-dioxide decrease, and of hyperpnea on nystagmus of the human being. They found that breathing carbon-dioxide-air mixtures increased the number of nystagmic movements, and that hyperpnea also increased the number. Lack of carbon dioxide produced a decrease in nystagmus only under severe anoxemia. The effects are temporary and normal reactions occur as soon as three minutes after withdrawal. The cortical neurons are extremely sensitive to alterations in oxygen supply, while the brain-stem centers studied, either because of more adequate blood supply or for other reasons, are relatively insensitive to such changes.

M. E. Marcove.

Marquez, M. **A new diagram of the action of the ocular muscles, etc.** Arch. de Oft. Hisp.-Amer., 1935, v. 35, Nov., pp. 561-568. (See Amer. Jour. Ophth., 1936, v. 19, April, p. 353.)

Sharpley, F. W. **Vision and illumination in coal mines with reference to miner's nystagmus.** Brit. Jour. Ophth., 1936, v. 20, March, p. 129.

This communication is divided into two parts. The first discusses deficient illumination and inability to make use

of foveal vision as affecting development of nystagmus. Illumination must be sufficient to permit the fovea to function normally. The coal face must reflect at least 0.01 candle per square foot. The second part of the communication concerns itself with the question of how to produce this amount of illumination. The reflection factor from a coal face is low. Cap lamps are preferable to hand lamps. Minimum illumination of 0.4 foot candle and an angle of distribution of between 100 and 130 degrees is desirable. Such an illumination of course would not be acceptable even in a poor workshop. (Bibliography.)

D. F. Harbridge.

Travers, T. àB. **Comparison between the visual results obtained by various methods employed for the treatment of concomitant strabismus.** Brit. Jour. Ophth., 1936, v. 20, Supplement.

This excellent monograph has eight chapters with seventeen tables, 21 illustrations, and a very full bibliography. Coöperation of patient, surgeon, and parents is essential for cure, which is possible only with normal visual acuity, binocular stereopsis, and parallel visual axes. The accomodative, muscular, and fusion theories of etiology are discussed. An important chapter deals with the question of binocular vision and abnormal retinal correspondence. The latter occurs in fifty to sixty percent of cases of squint, is most likely to occur when the onset of squint is very early in life, and is unlikely if the squint is less than ten degrees and rare when the angle is twenty degrees or less.

The optical treatment of squint is discussed in relation to refractive errors, use of bifocal glasses, and prisms. The essayist has studied the suppression scotoma, and illustrates his findings with numerous field charts. Treatment of amblyopia is by occlusion. Results depend much upon the age of the patient and the degree of coöperation. Relapse is frequent unless constantly guarded. Methods, scope and results of orthoptic treatment are examined. From the author's experience it would seem that operative results are just as uncertain in patients with normal correspondence as in those with abnormal correspondence.

D. F. Harbridge.

5. CONJUNCTIVA

Bengtson, I. A., and Rolufs, L. S. **Observations on the epithelial-cell inclusions of early uncomplicated trachoma.** Amer. Jour. Ophth., 1936, v. 19, March, pp. 229-238.

Brecher, L. **Preliminary communication on the beneficial influence of vitamin C on spring catarrh.** Klin. M. f. Augenh., 1935, v. 95, Dec., p. 796.

Prompted by the favorable results obtained by Hochwald from vitamin C in the treatment of different allergic affections, especially bronchial asthma, Brecher tried it very successfully in three cases of spring catarrh. This, like bronchial asthma, shows intermittent alkalosis of the blood and a marked eosinophilia. Vitamin C was applied partly by instillation of one-percent solution, partly with iontophoresis (anode).

C. Zimmermann.

Delanoë E. **Inoculation of acute trachoma in a woman to the eye socket of her husband.** Rev. Internat. du Trachome, 1935, v. 12, October, pp. 242-245.

Transfer from a case of acute trachoma to the right socket of the patient's husband resulted in typical trachoma after six weeks. The patient was not seen in the interval but the history showed that symptoms had begun on the sixth or seventh day.

P. J. Leinfelder.

Kogan, H. D. **Oculoglandular tularemia and Papino's conjunctivitis.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 474.

A twelve-year-old boy who had hunted water mice contracted oculoglandular tularemia, and within the next four days his mother and two sisters contracted the disease. The father was the only member of the family to escape infection. The ocular symptoms consisted in extensive edema of the lids, severe pain, scanty yellow secre-

tion, and the presence of yellow papules and necrotic areas on the conjunctiva. From a review of the literature the author concludes that the ocular involvement is primary and usually unilateral; that the disease attacks the palpebral conjunctiva, usually that of the lower lids, the eyeball remaining unaffected; and that the presence of tularemic papules is diagnostic.

Ray K. Daily.

Meyerhof and Habachi, S. **The daily mechanical treatment of cases of trachoma which are resistant to other methods of treatment.** Rev. Internat. du Trachome, 1935, v. 12, Oct., pp. 189-198.

The spontaneous healing of trachoma in some infants and children may be attributed to the youth of the tissue and the activity of the hemopoietic system. In intractable trachoma the author advocates daily scraping of the mucous membrane followed by instilling and rubbing in with an applicator 1 to 1000 bichloride of mercury solution. After the superficial scraping, adrenalin is instilled and the conjunctiva actively massaged. The author feels that the pannus is benefited by the smoothing of the conjunctiva. Improvement is noted in three to four days but treatment is continued for several weeks. (4 case reports.) P. J. Leinfelder.

Storts, B. P. **Ophthalmia neonatorum treated with gonococcus filtrate (Corbus-Ferry).** Arch. of Pediatrics, 1935, v. 52, Aug., p. 567.

Silver nitrate had been instilled at birth in the usual manner, but both eyes became infected. The child was not seen until it was seventeen days old. Beside hot packs of 1 to 10,000 bichloride solution, the child received three injections of the one to three dilution of gonococcus filtrate, 0.025 c.c., 0.05 c.c., and 0.1 c.c., at eight day intervals. The first and last doses were given intracutaneously and the middle injection was given intradermally. Twenty-four hours after each injection an intense skin reaction developed. The eyes became entirely negative in two weeks.

M. E. Marcove.

Strumia, M. M., and Scarlett, H. W. **Effect of bacterial lysate on staphylococcic keratoconjunctivitis in rabbits.** Arch. of Ophth., 1936, v. 15, Jan., pp. 47-58; also Trans. Amer. Ophth. Soc., 1935, v. 33, p. 364.

The results obtained by using bacterial lysate in six cases with chronic staphylococcic blepharoconjunctivitis and one with corneal ulcer are briefly reported. Experimental study in rabbits leads to the conclusion that the action of the bacterial lysate is not due to the lytic principal or bacteriophage, but to the dissolved bacterial proteins which produce local and general immunity through a process of local absorption.

J. Hewitt Judd.

6. CORNEA AND SCLERA

Alexandrovich, E. V. **Silver preparations in the treatment of corneal ulcer.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 865.

From a 1 to 10,000,000 to a 1 to 100,000 concentration of silver ions in water is used for its bactericidal effect in the treatment of suppurating wounds. The author tried this preparation in 26 cases of corneal ulcer and found that the average hospitalization was reduced from 28 days to 18 days.

Ray K. Daily.

Alvaro, M. E. **Syphiloma of the sclerotic.** Rev. Oto-Neuro-Oft., 1935, v. 10, Dec., p. 336.

A rare case of multiple syphiloma of the sclerotic, one at limbus and the other 8 mm. from it, accompanied by a gumma of the root of the nose, in a girl of ten years, with a positive Wassermann, is described. Following Igersheimer, the term syphiloma is preferred to that of gumma. Intramuscular antiluetic treatment was of no avail, but intravenous treatment promptly cleared up the nodules. The intactness and mobility of the conjunctiva over the nodule serves to distinguish the syphiloma from rheumatic episcleritis and phlyctenules. The diagnosis becomes more difficult when there is ulceration. A hard chancre has marked adenopathy. Epithelioma of the conjunctiva is almost always secondary

to that of the lids and rarely ulcerates. Accompanying lesions mark lupus, tuberculosis, and leprosy. A ciliary body sarcoma will have destroyed the globe before the gumma appears. Gumma of the ciliary body may simulate the condition. M. Davidson.

Barkan, H., and Borley, W. E. **Familial cornea plana, complicated by cataracta nigra and glaucoma.** Amer. Jour. Ophth., 1936, v. 19, April, pp. 307-310.

Gunderson, Trygve. **Herpes corneae, with special reference to its treatment with strong solution of iodine.** Arch of Ophth., 1936, v. 15, Feb., pp. 225-249.

This study is based on 250 attacks of dendritic keratitis in 225 cases. Inoculation of rabbits with scrapings from dendritic keratitis gave 63-percent positive results in 180 inoculations. The incidence was two and a half times as frequent in adult males as in females but in children the incidence was equal. The seasonal variations, the incidence of associated infections and trauma, and the occurrence of febrile herpes elsewhere are discussed. Various methods of treatment were tried and it is concluded that application of a strong solution of iodine is the most effective because of its destruction of the corneal epithelium containing the virus. Its use does not increase the amount of corneal scarring. (Tables and discussion.)
J. Hewitt Judd.

Hackett, C. J. **Interstitial keratitis, boomerang legs, and yaws in a European boy from New Hebrides.** Med. Jour. Australia, 1935, v. 2, Aug. 17, p. 213.

The obvious diagnosis in a case of interstitial keratitis with saber shins in a boy of 14 years with a positive Wassermann would be congenital syphilis, but in this case there was no indication of syphilis in the family and the patient lived in a locality where yaws is endemic and is often accompanied by saber shins and occasionally by interstitial keratitis. A similar case reported in the literature is briefly reviewed.
Edna M. Reynolds.

Kopp, I. F. **Histology of partial corneal transplantation.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 822.

Corneal transplantation was done in a thirteen-year-old girl who died from mastoiditis nine months later. Two transplants were made in the same eye six months apart, and microscopic sections demonstrate the healing process. The conclusions point to the possibility of transplantation provided the transplant contains Bowman's and Descemet's membranes, as well as unchanged corneal stroma; to the fact that opacification of the transplant is caused not by a degenerative process in the transplant but by the destructive action of connective tissues growing into the transplant from the iris; and to the value of including in operative records microscopic sections of excised cornea, which by demonstrating the structure of the tissue into which the transplant is made will help in demonstrating the biology of transplantation. Ray K. Daily.

Kozlowski, Bogumil. **A case of annular abscess of the cornea.** Klinika Oczna, 1935, v. 13, pt. 2, p. 326.

A worker 55 years of age developed a bilateral annular abscess of the cornea. No focus of infection could be discovered. Bacteriologically staphylococcus albus and aureus and short gram-positive bacilli were demonstrated. After a turbulent course and optical iridectomies following recovery from the inflammation, the patient was discharged with 5/35 vision.
Ray K. Daily.

Kuan, Kuo Ping. **White ring in the cornea.** Graefe's Arch., 1936, v. 135, p. 135.

To twelve cases of this condition reported in the literature, the author adds eleven more observed among 8,032 eye patients consulting one of the eye clinics of Vienna during a period of two years. The average size of the ring lies between 0.5 and 0.75 mm. In almost all cases the condition is unilateral. The ring frequently shows small indentations or diverticula. It is everywhere composed of small, sharply circumscribed, chalk-white particles. With the

slitlamp, these can be seen to lie in Bowman's membrane.

H. D. Lamb.

Magitot, A., Tille, H., and Dubois-Poulson. **Keratitis of nasal origin.** Ann. d'Ocul., 1936, v. 173, Jan., pp. 1-25.

Nasal pathology may produce keratitis by serving as a site for infectious agents, or by reflex nervous influence, or by a combination of the two. Subepithelial keratoconjunctivitis of the adult may be the result of trophic changes from irritation of the nasal nerve by intranasal pathology. These cases rapidly improve after cocainization or cauterization of the inferior turbinate. There is a type of follicular conjunctivitis with corneal involvement resembling trachoma that responds rapidly to treatment of nasal disease. A number of cases of each type are reported, illustrating the rapidity of improvement after treating the underlying nasal disease. John C. Long.

Moreu, Angel. **New remarks about pathogenesis, diagnosis, and treatment of tuberculous infiltration of the cornea (parenchymatous keratitis).** Arch. de Oft. Hisp.-Amer., 1935, v. 35, Nov., pp. 569-588.

The author believes that tuberculous keratitis is secondary to tuberculous iridocyclitis. In case of very mild iridocyclitis, the biomicroscope revealed precipitates on the posterior surface of the cornea. With Troncoso's gonioscope tubercles were detected in the iris near the irido-corneal angle. Cure was obtained with atropin, phototherapy, intramuscular gold injections, and local autohemotherapy. In rabbits the author reproduced the clinical and histologic changes of tuberculous keratitis by injecting aqueous humor from patients with tuberculous iridocyclitis. (5 illustrations.) R. Castroviejo.

Protopopov, B. V. **Corneal sensitivity in trachoma.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 908.

Tabulated findings in 106 eyes showed diminished corneal sensitivity in the region of the pannus and over a portion of the clear cornea below it. The size and degree of involvement of the transparent area increase with the degree of pannus and the duration of the disease. Ray K. Daily.

Rameev, P. C. **Some late results of Denig's operation.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 933.

In one case there was unusual hypertrophy of the transplant, which after five years formed a growth the size of a cherry. In the other case the transplant was absorbed, whereas the pannus remained unchanged. Ray K. Daily.

Towbin, B. G. **The use of carotin in corneal transplanting.** Zeit. f. Augenh., 1936, v. 88, Jan., p. 107. (See Amer. Jour. Ophth., 1935, v. 18, Sept., p. 872.)

Uyama, Yasuo. **White ring in the cornea.** Arch. of Ophth., 1936, v. 15, Feb., pp. 309-311.

A woman aged 42 years presented a superficial white circle, which when removed stained with sudan III, showing that it was composed of fat. (Photomicrograph and drawing.)

J. Hewitt Judd.

Zaionchkovski, M. I., and Kogan, E. S. **Punctate corneal opacities and their effect on visual acuity after pilocarpin miosis.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 834.

In order to settle the question whether central punctate corneal opacities caused by corneal foreign bodies should disqualify a candidate for military air service, the author examined nineteen candidates after contracting their pupils with pilocarpin. From the tabulated findings he concludes that the candidate should be rejected if visual acuity is reduced below 0.8 by the use of a pin-point diaphragm. When vision is not reduced by the diaphragm the candidate should be further examined with the pupil contracted by pilocarpin and the effect on accommodation corrected by glasses.

Ray K. Daily.

Ziporkes, Joseph. **"White ring" in the cornea.** Arch. of Ophth., 1936, v. 15, Jan., pp. 112-114.

This condition was found in a lady aged 52 years and in a man aged 24

years. Similar cases previously reported are noted. (Drawing.)

J. Hewitt Judd.

7. UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Anargyros, El. **Spontaneous cysts of the posterior surface of the iris.** Zeit. f. Augenh., 1936, v. 88, Jan., p. 93.

Spontaneous acquired nontraumatic cysts of the posterior surface of the iris are rare. In this case irregular black masses, whose surface had the character of the ectodermal part of the iris, projected into the pupil from almost the entire margin. A clinical diagnosis of benign proliferation—melanoma or cyst with secondary glaucoma—was made. At operation the iris immediately prolapsed into the wound, while the posterior black mass remained in place. A large iridectomy was done, and with the iris tissue much of the black mass was removed. Histologic preparations revealed cysts of iris epithelium attached by means of a slender pedicle.

F. Herbert Haessler.

Archangelskii, V. H. **Sympathetic ophthalmia and the neurogenic factor in the transmission of the disease from the first to the second eye.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 737.

A study of the histopathology of sympathetic ophthalmia demonstrates to the author the similarity between the pathology of the ciliary nerves and the changes in the nervous system in symmetric involvement of other tissues. Leaning on Speranski's theory of neurotropic disturbances, the author regards sympathetic ophthalmia as a neurotropic uveal disturbance, caused by prolonged low-grade chronic inflammation of the peripheral endings of the ciliary nerves. Anatomic findings demonstrate that the pathologic changes localize in the outer layers of the choroid and in the anterior portion of the ciliary body, where the net of nerve endings is particularly dense. Early enucleation eliminates low-grade chronic irritation of the ciliary nerve endings, and the surgical trauma creates new functional readjustments in the nervous system which lead to interruption of the process in the sympathizing eye. If delayed until the function of the nervous elements has become altered, the effect of enucleation on the course of the disease in the sympathizing eye will be negative. (Illustrations.)

Ray K. Daily.

Cowan, Alfred. **Congenital and familial cysts and flocculi of the iris.** Amer. Jour. Ophth., 1936, v. 19, April, pp. 287-291.

Gallino, J. A. **Rubeosis iridica.** Arch. de Oft. de Buenos Aires, 1936, v. 11, Feb., p. 39.

While under treatment with insulin, a diabetic developed a slight iritis with hypertension in the left eye and a large network of enlarged vessels, starting from one at the five o'clock position and spreading over the pupillary zone of the iris. There was no occlusion of the pupil, no synechia, no iris atrophy, no depigmentation. M. Davidson.

Gastev, A. A., Mankovetzki, S. I., and Vosnesenskaja, A. L. **Sympathetic ophthalmia in a case of malignant neoplasm.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 783.

A blind eye was enucleated because of a low-grade uveitis in the fellow eye. The microphotographs showed sarcoma of the choroid and typical sympathetic uveitis. This is the sixth case reported in the literature in which an intraocular neoplasm was the etiologic factor in sympathetic ophthalmia, without perforation of the ocular wall.

Ray K. Daily.

Horner, W. D. **Treatment of iris bombé by iridectomia ab externo.** Arch. of Ophth., 1936, v. 15, Jan., pp. 70-77; also Trans. Pacific Coast Oto-Ophth. Soc., 1935, 23rd annual meeting, p. 123.

The technique of the operation and its advantages are set forth. Five cases are reported in which a satisfactory coloboma was obtained in spite of complete annular synechiae. The operation is advocated because of its simplicity,

its wide application, and its comparative freedom from operative shock and injury to the lens. J. Hewitt Judd.

Horner, W. D., and Bettman, J. **Synthetic suprarenin bitartrate as a mydriatic.** Amer. Jour. Ophth., 1936, v. 19, April, pp. 311-315.

Kossina, E. G., Levkoeva, E. F., and Pertzeva, V. A. **A consideration of the histopathology of sympathetic ophthalmia from a contemporary standpoint.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 753.

Detailed histopathologic study of 24 eyes is given. Ten showed macroscopic thickening of the entire uveal tract, a frank tuberculous histologic structure, and diffuse changes in the choroid. In nine of these ten cases the iris was involved. The other fourteen cases were characterized by slight involvement of the choroid, which consisted of localized round-cell infiltrations, well marked only in two cases; in seven the tuberculous structure was pronounced in the anterior segment, and in the rest the pathologic picture was that of lymphocytic infiltration with occasional epithelioid cells. The findings support Hippel's statement that the histopathologic picture of sympathetic ophthalmia does not refute the diagnosis of tuberculosis. (Illustrations.)

Ray K. Daily.

Samuels, Bernard. **Notes on the pathology and surgical treatment of sympathetic ophthalmia.** Arch. of Ophth., 1936, v. 15, Jan., pp. 59-69.

The histologic observations in the exciting eye and in the sympathizing eye are described and illustrated by drawings. The anatomic differentiation from septic endophthalmitis and granulation tumors is discussed. Enucleation is preferable since with evisceration it is impossible to remove extensions into the emissary vessels in the sclera. In cases with increased tension repeated paracentesis well away from the limbus is the only procedure to be used, since the cornea is the only structure free from inflammation. J. Hewitt Judd.

Shivarova, E. D. **Retinal changes in sympathetic ophthalmia.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 793.

Detailed histologic study of two exciting and two sympathizing eyes demonstrates that there are no retinal changes characteristic of the disease. (Illustrations.) Ray K. Daily.

Smith, Henry. **The aqueous; its generation, functions and circulation.** Arch. of Ophth., 1936, v. 15, Jan., pp. 40-46; also Trans. Ophth. Soc. United Kingdom, 1935, v. 15, p. 414.

The aqueous is secreted by the ciliary epithelium, which possesses the power of selection and rejection necessary to produce a pabulum of consistent composition. When this epithelium becomes diseased, the aqueous is abnormal and the structures to which it supplies nourishment will become diseased. It is urged that examinations be made of the aqueous from living diseased eyes. The circulation of the aqueous shows rhythmic pulsations which represent the opening and closing of the sluice gate at the rate of about four times per minute. The explanation offered is that the muscle pulls back the scleral spur, the fluid runs through the spaces of Fontana, the muscle then relaxes, and the elastic pectinate ligament adjusts the scleral spur as a valve.

J. Hewitt Judd.

Stark, Adolph. **Pseudo-Argyll Robertson pupil in a patient with intestinal parasites.** Klinika Oczna, 1935, v. 13, pt. 2, p. 351.

A patient with intestinal parasites developed meningoencephalitic symptoms with maximal mydriasis and loss of reaction to light; the pupil reacted to convergence, but immediately dilated again. A week after treatment was begun the pupillary reactions were normal. The writer attributes the symptoms to a central toxic process which diminished the tonus of the sphincter pupillae and increased the tonus of the dilator. Ray K. Daily.

Starodubtzeva, A. I. **Gravidan in the treatment of iritis.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 860.

From 26 cases of iritis treated with gravidan the author is convinced that it shortens the course of the disease, alleviates pain, and raises the general biologic tone. Ray K. Daily.

8. GLAUCOMA AND OCULAR TENSION

Barkan, Otto. **The structure and functions of the angle of the anterior chamber and Schlemm's canal.** Arch. of Ophth., 1936, v. 15, Jan., pp. 101-110.

An attempt is made to correlate with previous anatomic knowledge the structures of the angle of the anterior chamber as seen in the living eye by slitlamp microscopy. The angle is found to be narrower in the upper than in the lower part. An abnormal pectinate ligament does not seem to predispose to glaucoma, but appears to be a vestigial remnant without functional significance.
J. Hewitt Judd.

Biró, J. **Bilateral nevus flammeus and glaucoma.** Zeit. f. Augenh., 1936, v. 88, Jan., p. 80.

In a nine-year-old girl in whom bilateral vascular nevus of the face had been present since birth, visual disturbances had been noticed for one year before she came to the clinic. There was increased tension with contraction of the visual field, deep glaucomatous excavation of the discs, and a circumpapillary halo. In the literature, the author was able to find only five cases of bilateral nevus. In these patients, dilated conjunctival vessels were noted, and in four the cornea was enlarged. Despite high tension, the anterior chamber was deeper than normal. Important in explanation of the etiology is Roth's observation that the nevus develops because of vasomotor disturbance rather than as a primary developmental anomaly of the vessels.
F. Herbert Haessler.

Elliot, R. H. **Some points in connection with sclerocorneal trephining.** Brit. Med. Jour., 1935, Aug. 24, p. 334.

Elliot emphasizes the fact that dragging uveal tissue into the trephine hole is to invite uveal impaction. He recommends the use of a hand-controlled trephine because it allows the trephine blade to make its first entry on the corneal side of the wound. He also recommends a long concentric incision and a small peripheral iridectomy, and emphasizes the importance of dissecting the conjunctival flap right to the limbus.

A case is reported in which the first aperture closed and the second trephine hole became blocked by uveal tissue which bulged through the trephine hole. The conjunctiva was ballooned up by an injection of novocaine and adrenalin, a Ziegler needle-knife was introduced subconjunctivally, and the base of the iris prolapse was cut through. This procedure was followed by marked lowering of tension and decided improvement in vision. The fact that the use of atropin for several weeks after operation is vital to the success of sclerocorneal trephining is stressed, as well as the great value of postoperative massage. If cataract extraction is necessary in an eye which has been trephined for glaucoma, the part of the incision opposite the filtering scar should be made in the cornea, with a broad bridge on one side of the incision.
Edna M. Reynolds.

Grosz, Etienne de. **Ionization with glaucosan.** Arch. d'Opht., 1936, v. 53, Jan., p. 25.

Following the method of Van Heuven (Utrecht), the author treated fourteen patients, using glaucosan in dilutions of from 1 in 250 to 1 in 1000, and a current of 1 milliampere for 1 minute. Usually two treatments were found necessary. Secondary glaucoma in an aphakic eye and in acute iritis, in chronic cyclitis, and in uveitis responded in a striking manner. There was no effect in other secondary glaucomas. The treatment is not indicated in primary glaucoma or hemorrhagic glaucoma. The advantages of ionization over instillation are: (1) It is rapid. (2) It is not painful with the weak dilutions used. (3) It is not accompanied by absorption effects. If the current is used for too long a time an opacity of the cornea ensues, which generally disappears after a time. (Bibliography, illustration.) Derrick Vail.

Kirwan, E. O'G. **The ocular complications of epidemic dropsy.** Indian Med. Gaz., 1935, v. 70, Sept., p. 485. (See Amer. Jour. Ophth., 1934, v. 17, Dec., p. 1184.)

Sobanski, Janus. **The eye and the circulatory apparatus.** Klinika Oczna, 1935, v. 13, pt. 2, p. 201.

The author's investigations show that the average arterial retinal tension is 48/80 mm. of Hg., and the average venous retinal tension is 19/32 mm. of Hg. The venous retinal tension is in close relation to the cerebrospinal pressure, while the arterial retinal tension is affected by changes in general blood pressure and in venous retinal pressure. The latter affects the diastolic arterial retinal pressure much more than the systolic. Intraocular tension scarcely influences venous retinal pressure but it exerts a tremendous effect on arterial retinal pressure. A variation of 6 to 10 mm. of Hg. in intraocular tension may have serious consequences on retinal circulation. By report of a series of cases the author shows that diastolic arterial tension is the important factor in the genesis of glaucomatous excavation, which is found only in cases in which diastolic retinal pressure is relatively low, so that the increased intraocular tension leads to compression of the vessels and disturbance in the metabolism of the nerve fibers. Cases of glaucoma with normal intraocular tension are found to have very low diastolic retinal tension, for which the normal intraocular tension is too high. These findings lead the author to urge caution in the reduction of the general bloodpressure in patients with glaucoma, because high diastolic arterial tension safeguards the eye from glaucomatous changes. A report of a series of cases demonstrates that in tabes optic atrophy does not set in so long as the diastolic retinal arterial pressure remains normal or higher, or as long as the intraocular tension remains normal or lower. But as soon as the diastolic arterial retinal pressure becomes low in relation to intraocular tension optic atrophy sets in. Very frequently this disturbance in the retinal circulation is ushered in or aggravated by specific treatment. Therefore the objective in treatment of tabetic optic atrophy should be maintenance of high diastolic retinal pressure and low intraocular tension. Ray K. Daily.

Traquair, H. M. **Glaucoma, with special reference to medical aspects and early diagnosis.** Brit. Med. Jour., 1935, Nov. 16, p. 933.

The various forms of glaucoma are considered as exacerbations in the course of primary glaucoma and not different kinds of glaucoma. Emphasis is laid upon the fact that glaucoma may exist for years without producing any symptoms whatever and without producing field changes.

The earliest field change produced is baring of the blind spot. Enlargement of the blind spot and flame-shaped or tuft-like scotomata are not initial field changes in glaucoma. The arcuate scotoma is a relatively late field change and does not begin as an outgrowth from the blind spot. Three stages in early glaucoma are differentiated: (1) the initial stage without symptoms, (2) the preperimetric stage, before development of field changes, and (3) the stage presenting early field changes. The diagnosis cannot be made in the first but should usually be made in the second stage. Edna M. Reynolds.

Tumiantzev, H. F. **The early diagnosis of glaucoma.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 936.

A discussion of the early signs of glaucoma with emphasis on halos around lights. Ray K. Daily.

Tumiantzev, H. F. **A rare complication of prodromal glaucoma.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 945.

A patient 65 years of age, with diagnosis of prodromal glaucoma, suddenly noticed in his only eye a network of threads moving with the eye. This peculiar phenomenon appeared after staying out bareheaded on the beach, reappeared after full meals, close work,

and sun baths, and interfered with reading. The author attributes it to transudation of red cells from the iris into the anterior chamber, brought on by vascular dilatation.

Ray K. Daily.

9. CRYSTALLINE LENS

Beach, S. J., and McAdams, W. R. **Intracapsular extraction of cataract in the average practice. Report of one hundred cases in which Verhoeff's method was used.** Arch. of Ophth., 1936, v. 15, Jan., pp. 95-100.

This series shows that the technique used is suitable for the operator with average opportunities as well as for one in a large clinic. Central vision of 6/9 or better was obtained in 84 percent. The preoperative, operative, and postoperative complications are discussed and tabulated. (Discussion.)

J. Hewitt Judd.

Bellows, John. **Biochemistry of the lens. 5. Cevitamic acid content of the blood and urine of subjects with senile cataract.** Arch. of Ophth., 1936, v. 15, Jan., pp. 78-83.

Cataract subjects show a decidedly lower concentration of cevitamic acid in the blood plasma than normal subjects and a large quantity of vitamin C is required to cause an increase of the vitamin-C content of the plasma than in normal subjects. It is concluded that diminution in the amount of this substance in the aqueous and lens of cataractous eyes precedes the development of opacities and is not secondary to it.

J. Hewitt Judd.

Boardman, W. W. **Rapidly developing cataracts after dinitrophenol.** California and Western Med., 1935, Aug., v. 43, p. 118.

The author discusses this type of rapidly developing cataract. In one month ten such cases came to his attention. (Discussion.)

M. E. Marcove.

Cogan, D. G., and Cogan, F. C. **Cataracts and dinitrophenol.** New England Jour. Med., 1935, v. 213, Oct. 31, p. 854.

Twenty cases of cataract developing after the use of dinitrophenol are reviewed. The lens changes were all of the cataracta complicata type with initial involvement of the posterior cortex. No correlation was found to exist between development of cataracts and the amount of the drug taken or the length of time during which it was taken. Apparently individual susceptibility is the significant factor in the development of dinitrophenol cataracts, which, unlike other toxic manifestations of the drug, occur after therapeutic doses. Tissue anoxemia with consequent damage to the lens epithelium is assumed to be the cause of cataract formation.

Edna M. Reynolds.

Collin, L. **Intracapsular cataract extraction.** Ann. d'Ocul., 1936, v. 173, Jan., pp. 43-46.

Collin describes his method, including retrobulbar injection, akinesia, preliminary homatropin, a long conjunctival flap without suture, and total iridectomy. The lens is grasped with Kalt forceps and the zonular fibers are ruptured by lateral and rotatory movements. The lens is then removed with the forceps, light counter pressure being made below the cornea. Pilocarpin is instilled.

John C. Long.

Dozorova, H. S. **Complications during extraction of senile cataract.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 6, p. 855.

A review of the complications of 252 cataract extractions.

Ray K. Daily.

Fazakas, Alexander. **Cure of epithelialization of anterior chamber by means of steam cautery.** Zeit. f. Augenh., 1936, v. 88, March, p. 315.

Epithelial proliferation into the anterior chamber occurred as a complication after cataract extraction. On reopening the wound, a thin pellicle could be grasped with forceps and pulled from the coloboma and surrounding iris. The lips of the wound were then spread and the steam cau-

tery applied. The eye healed with visual acuity of 6/12, which has remained unchanged for four years.

F. Herbert Haessler.

Khalil, M. **The extraction of cataract by the electro-diafaco method.** Brit. Jour. Ophth., 1936, v. 20, March, p. 167.

The author describes the method and instruments used in performing the Lopez Lacarrère operation. The electrode handle consists of a capillary glass tube inside of which are two fine steel wires of 0.14 mm. diameter. With a spring the wires can be made to extend about 2 mm. beyond the end of the class tube. Control of the current is by means of a foot-interruptor. The wire is first protruded and rested lightly on the lens capsule, and does not penetrate the lens. Current is applied for an instant at between 80 and 90 milliamperes. The lens becomes firmly adherent by coagulation and is then extracted. D. F. Harbridge.

Lebensohn, J. E. **Biochemistry of the lens; 6. mineral metabolism in the normal and in the cataractous lens.** Arch. of Ophth., 1936, v. 15, Feb., pp. 217-221.

The sodium, potassium, and calcium content of the cortex and nucleus was determined for normal adult bovine lenses and human cataractous lenses. It was found that the nucleus normally contained a greater proportion of basic ions than the cortex. The gain in sodium is thought to compensate osmotically for the loss in potassium. The calcium accumulation in cataract is mostly in the nucleus. Mineral analyses indicate that cataractous degeneration is a diffuse process involving equally cortex and nucleus. J. Hewitt Judd.

Mann, Ida. **Developmental defects of the lens and their embryology.** Glasgow Med. Jour., 1935, v. 124, Aug., p. 49, and Sept., p. 126.

The normal development of the lens is reviewed and the abnormalities which are ectodermal in origin are discussed in detail. These include congenital aphakia, secondary aphakia, the various forms of congenital cataract, congenital dislocation of the lens, and microphakia. In the second part the defects of the lens connected with abnormalities of the vascular capsule are described, such as coloboma, posterior lenticonus, umbilication, and posterior polar cataract.

Edna M. Reynolds.

Mann, W. A., Jr. **Cataract due to dinitrophenol.** Arch. of Ophth., 1936, v. 15, Jan., pp. 116-117.

Bilateral cataracts developed rapidly in a woman aged 27 years after rather large doses of this drug over a period of several months. J. Hewitt Judd.

Nugent, O. B., and others. **Cataract symposium.** Illinois Med. Jour., 1935, v. 68, Sept., p. 230.

These papers consider cataract from the following angles: slitlamp findings, preöperative preparation, anesthesia, intra- and extracapsular extraction, senile cataract, and prevention of complications. Theodore M. Shapira.

Seidel, E. **Fundamental facts in cataract operation.** Graefe's Arch., 1936, v. 135, p. 159.

Residual lens fibers produce less postoperative inflammation than frequent entering of the eye with instruments to remove the last lens remains. In 200 extracapsular cataract extractions with iridectomy, in which all the lens remains possible were left in the eye, the course of healing was entirely without inflammation. To diminish trauma still further, no iridectomy is done. Subsequent prolapse of the iris is prevented by the instillation of one drop of 1 percent eserin immediately after the operation. The author has desisted from intracapsular extraction because removal of the posterior lens capsule exposes the vitreous to greater danger from infection and because tearing loose of the lens from support by the ciliary epithelium and the anterior part of the retina is prone to produce retinal tears and a tendency to retinal detachment. One half to one hour before the operation, one-percent atropin is always instilled. At the operation,

ten-percent cocaine is used five to six times at one-minute intervals, together with two drops of adrenalin. A conjunctival flap is made. After the corneal section, the only instruments to enter the eye are Förster's capsule forceps and the iris repositor. Secondary cataract is best prevented by grasping and removing with the capsule-forceps as large a piece of the anterior lens capsule as possible. The same procedure is used successfully in high grade myopia, in the eyes of diabetics, and in immature cataract. H. D. Lamb.

Spaeth, E. B. **Dinitrophenol cataracts with signs of tetany.** Amer. Jour. Ophth., 1936, v. 19, April, pp. 320-323.

Vail, Derrick. **Epithelial downgrowth into the anterior chamber following cataract extraction; arrest by radium treatment.** Arch. of Ophth., 1936, v. 15, Feb., pp. 270-282; also Trans. Amer. Ophth. Soc., 1935, v. 33, p. 306.

The previously reported cases are summarized and a case is reported in which the downgrowth of epithelium was arrested by application of radium. The author feels, however, that roentgen rays are more effective. Experimental data indicate that newly developed epithelial cells are destroyed by roentgen rays more easily than malignant cells or normal epithelium. (Photograph, drawings.) J. Hewitt Judd.

Veasey, C. A. **Report of two cases of cataract following the use of dinitrophenol.** Amer. Jour. Ophth., 1936, v. 19, April, pp. 332-334.

Vinsonhaler, F., and Cosgrove, K. W. **Hereditary cataract of the senile and presenile types.** Arch. of Ophth., 1936, v. 15, Feb., pp. 222-224.

The genealogic chart of the Loy family shows 22 individuals in six generations who developed cataract. They follow closely the rules of Nettleship in that the descent is direct and no generations are skipped. Transmission was from unlike sex in twelve instances and like sex in nine. In each succeeding generation the age of onset decreased about a decade, but the age of onset is approximately the same in persons of the same generation.

J. Hewitt Judd.

10. RETINA AND VITREOUS

Castroviejo, Ramon. **Experimental detachment of the retina.** Arch. de Oft. Hisp.-Amer., 1935, v. 35, Nov., pp. 589-596.

Experimental detachments by trauma, introduction of foreign bodies, or withdrawal of vitreous have proved temporary, and the detachments bore no resemblance to human idiopathic detachment. The author has been able to produce retinal detachment resembling the human idiopathic variety and which, when the report was made, had already lasted seven months. The procedure follows: The sclera is exposed. With the Arruga orientation needle a 3-mm. incision is made through sclera, choroid, and retina. With a hypodermic syringe having a blunt needle, from one-half to two-thirds of the vitreous is withdrawn. The retina is then separated from the choroid with a spatula, and the vitreous previously withdrawn is reinjected into the choroidoscleral space just formed. A suture previously inserted closes the scleral and conjunctival incisions. (2 illustrations.) R. Castroviejo.

Cockayne, E. A., Krestin, D., and Sorsby, A. **Obesity, hypogenitalism, mental retardation, polydactyly, and retinal pigmentation: the Laurence-Moon-Biedl syndrome.** Quarterly Jour. of Med., 1935, v. 4, April, p. 93.

Two families are reported in each of which several members showed the above syndrome. The two families showed strikingly different types of retinal pigmentation. In one family there was typical retinitis pigmentosa with large pigment deposits along the retinal vessels toward the periphery, while in the other family the pigmentary disturbance was very slight. The macular regions were stippled and there was some fine pigmentation in the periphery.

Edna M. Reynolds.

Doods, E. C. **Diseases of the blood and their ophthalmological complications.** (Symposium, see also Lawson, A., Panton, P. N., and Tidy, H. L.) Trans. Ophth. Soc. United Kingdom, 1935, v. 55, p. 43.

The ocular complications of albuminuric retinitis and sudden blindness have no chemical basis for explanation in the pathology of albuminuric retinitis, and the condition can be ascribed to damage of the walls of the retinal arteries. No explanation is available at the present time for the onset of sudden blindness which occurs in chronic nephritis. In diabetes, the characteristic alterations in the blood are an increase in glucose and acetone bodies and a decrease in the alkali reserve.

Beulah Cushman.

Hoehne, H. **The etiology of macular coloboma.** Zeit. f. Augenh., 1936, v. 88, March, p. 297.

Of the so-called colobomata of the macula, some are unquestionably congenital anomalies of development, but it is equally true that others result from a fetal or postnatal inflammatory process. The author describes three eyes in which the macular coloboma seemed inflammatory in origin.

F. Herbert Haessler.

Karbacher, P. **Concerning the relationship between certain retinal and spontaneous leptomeningeal hemorrhages.** Schweiz. med. Woch., 1936, no. 8, Feb. 22, p. 201.

Karbacher says that histologic examination shows the improbability that blood from the subarachnoid space enters the sheaths of the optic nerve and from there travels direct to the interior of the eye through the lamina cribrosa. He reports a case showing simultaneous appearance of venous stasis in the eye in retinal and leptomeningeal bleedings. He says that in papilledema extensive retinal bleeding, especially into the vitreous, is rare. In cases of leptomeningeal bleeding, such hemorrhages are common, but it is difficult to say that these hemorrhages depend upon papilledema.

Theodore M. Shapira.

Kerr, H. **Surgical treatment of retinitis pigmentosa.** Amer. Jour. Surg., 1935, v. 28, May, p. 364.

Kerr describes eight cases which were operated upon, five showing no improvement, and three being improved. He suggests superior cervical sympathectomy if the vision is not less than 0.1, if the macula is not involved, and if the fields are not less than 10 degrees. Theodore M. Shapira.

Kraupa, Ernst. **On the question of posterior annular vitreous detachment.** Zeit. f. Augenh., 1936, v. 88, Feb., p. 224.

There are many factors that may play a part in the genesis of retinal detachment, and it is, therefore, a mistake to seek the one cause of the lesion. It is certain that the retina is safe from danger of detachment when the limiting membrane of the vitreous is intact. This is the internal stratum of the limitans interna and does not stop at the disc margin but completely covers this structure. It can be detached from the disc by exudate or hemorrhage and sometimes does not return to its normal position after the exudate subsides. Holes occur in this membrane and, as it becomes enlarged, concentration of fibers develops at the margins of the holes. The mechanism is easily demonstrated by poking a finger through gauze. Such holes are readily demonstrable by using for ophthalmoscopy a micro-art lamp, which for this purpose is superior to all other light sources, including red-free, and is entirely harmless as well as only slightly annoying to the patient. Perforation of the limiting membrane of the vitreous is not harmless; for it may be a cause of retinal detachment and is responsible for most vitreous opacities. The latter are consequently not amenable to treatment. F. Herbert Haessler.

Lawson, Arnold. **Diseases of the blood and their ophthalmological complications.** (Symposium, see also Doods, E. C., Panton, P. N., and Tidy, H. L.) Trans. Ophth. Soc. United Kingdom, 1935, v. 55, p. 27.

Retinal hemorrhages in blood disease are usually due to changes in the capillary endothelium, from primary loss of nutrition with increased permeability of the capillary endothelium. In diabetic retinitis low blood calcium is an essential factor in the production of hemorrhages, and calcium administration seems here to have a profound effect in control of retinal hemorrhages.

Beulah Cushman.

Marble, A., and Smith. R. M. **Blood lipids in lipemia retinalis.** Arch. of Ophth., 1936, v. 15, Jan., pp. 86-94.

Detailed studies were made of the values for total lipids, fatty acids, total and ester cholesterol and phospholipins in cases of lipemia retinalis occurring in two boys with severe diabetes which had been poorly controlled. The lipid content of the blood was 14.1 percent in the first case and 7.5 percent in the second. The largest increase took place in the fatty acid fraction, next in the cholesterol, and third in the phospholipin fractions. Lipemia retinalis occurs in diabetic patients who are acidotic or who have recently been acidotic, but it does not parallel the degree of acidosis and may persist after acidosis has disappeared. Nine cases are summarized. It is pointed out that the prognosis is not always poor as two patients have lived on for more than twelve years.

J. Hewitt Judd.

Panton, P. N. **Diseases of the blood and their ophthalmological complications.** (Symposium, see also Doods, E. C., Lawson, A., and Tidy, H. L.) Trans. Ophth. Soc. United Kingdom, 1935, v. 55, p. 47.

A review of 117 cases of pernicious anemia treated before the use of liver therapy at the London Hospital between the years 1911 and 1920 is given. Of these 116 died of the anemia in varying periods of time, and only one patient died of another complaint. Only two complained of visual disturbances. One who had pale discs had fairly advanced cord changes and had been treated with atoxyl. The other had edema of both discs and retinae and many linear hemorrhages in the fundus. Reports on fundus examinations were made in 41, and of these 19 were recorded as free from changes other than pallor of the retina, and in 22 hemorrhages mostly multiple and small were observed. Since the advent of liver therapy the author has had no case with serious complaint of loss of vision.

Beulah Cushman.

Richner, H. **Inheritance of retinal detachment.** Graefe's Arch., 1936, v. 135, p. 49.

Among 32 families with spontaneous detachment of the retina, in 14 the detachment was observed in a single generation and in 18 families in successive generations, although not as a rule in over two generations. The inheritance may skip a generation or progress into a sideline. A dominant type of inheritance seems possible. In 22 families comprising 41 individuals, myopia was associated with retinal detachment, although it is not stated that the myopia was always an axis myopia.

H. D. Lamb.

Shivarova, E. D. **Retinal changes in sympathetic ophthalmia.** Sovietskii Viestnik Opht., 1935, v. 7, pat. 6, p. 793. (See Section 7, Uveal tract, sympathetic disease, and aqueous humor.)

Sobanski, Janus. **The eye and the circulatory apparatus.** Klinika Oczna, 1935, v. 13, pt. 2, p. 201. (See Section 8, Glaucoma and ocular tension.)

Tidy, H. L. **Diseases of the blood and their ophthalmological complications.** (Symposium, see also Doods, E. C., Lawson, A., and Panton, P. N.) Trans. Ophth. Soc. United Kingdom, 1935, v. 55, p. 35.

Fundus changes are present in nearly all cases before death, and are due partly to defective nutrition of the endothelium of the capillaries and partly to migration of leucocytes. Retinal hemorrhages are very rare in secondary anemia. Posthemorrhagic anemia alone does not result in retinal changes, some factor of malnutrition of

the vessel walls being essential. The disturbance of vision may be immediate, due to temporary anemia of the cortical visual centers or of the retina locally, or delayed, perhaps due to degeneration of retinal nerve elements from lack of nutrition, or to pressure by edema in the optic nerve sheath.

Beulah Cushman.

Viallefont, H. **The relationship of the hypophysis and the retina.** Ann. d'Ocul., 1936, v. 173, Jan., pp. 33-42.

Two cases of retinitis pigmentosa in mother and daughter were treated by injection of pituitary extract. In the mother the visual acuity improved from 0.2 in each eye to O.D. 0.3 and O.S. 0.5. After cessation of treatment the vision decreased to O.D. 0.2 and O.S. 0.3. Injection of the extract was then resumed and vision again improved to O.D. 0.3 and O.S. 0.6. In the daughter, vision improved from O.D. 0.3 and O.S. 0.5 to O.D. 0.4 and O.S. 0.7. A case of disseminated chorioretinitis showed considerable improvement. There were no changes in fundus appearance.

John C. Long.

Victoria, M., and Lijo Pavia, J. **Is early diagnosis of hereditary cerebellar ataxia possible from the eye findings?** Rev. Oto-Neuro-Oft., 1935, v. 10, Dec., p. 323.

While Pierre Marie thought that the ocular manifestations in the disease which bears his name were a late phenomenon, Sanger Brown had already called attention to their early appearance. Subsequent observations and refinements have confirmed Brown's observations. On the basis of a slight but uniform concentric contraction of the visual fields and incipient degenerative changes of the retinal nerve fibers in a boy of fourteen years, otherwise normal, whose brother of 24 and sister of 23 years are frank cases of hereditary cerebellar ataxia, the author makes a tentative diagnosis of the same malady. The sister could not be subjected to the same examinations.

M. Davidson.

11. OPTIC NERVE AND TOXIC AMBLYOPIAS

Biernacka-Biesiekierska, J., and Wieczorek, Anton. **Familial prepapillary hyalin verrucosities, accompanied by congenital syphilitic chorioretinitis.** Klinika Oczna, 1935, v. 13, pt. 2, p. 336.

Three of seven members of one family were found to have prepapillary hyalin verrucosities, as well as syphilitic pigment changes in retina and choroid. After a review of the literature the authors attribute this anomaly to disturbances in the fetal development. (Photographs.)

Ray K. Daily.

Clark, C. P. **Role of malaria in control of atrophy of the optic nerve due to syphilis.** Arch. of Ophth., 1936, v. 15, Feb., pp. 250-269.

Eight patients with tabes and two each with dementia paralytica and dementia paralytica of the tabetic form were treated with induced malaria. One case proved resistant. Eight patients showed improvement but in four the optic atrophy was so advanced that blindness ensued. The state of the pupils was unchanged in all. The means by which the defense against syphilis is effected is chiefly through stimulation of the reticulo-endothelial system. The other factors are fever, vasodilatation, and increased body metabolism.

J. Hewitt Judd.

NEWS ITEMS

Edited by Dr. H. Rommel Hildreth
640 S. Kingshighway, St. Louis

News items should reach the Editor by the twelfth of the month.

Deaths

Dr. John Cutting Berry, Worcester, Mass., aged 89 years, died February 9, 1936, of myocarditis.

Dr. Thomas Ethelbert McConnell, Oil City, Penn., aged 66 years, died in January, 1936, of coronary occlusion.

Dr. McCluney Radcliffe, Philadelphia, aged 81 years, died February 28, 1936, of pneumonia.

Miscellaneous

The American Academy of Ophthalmology and Otolaryngology desires to announce that a Scientific Exhibit will be one of the features during the New York Convention, September 26 to October 3, 1936. Applications for space should be sent direct to Dr. S. J. Kopetzky, 51 West 73rd St., New York City, for Otolaryngology and to Dr. Ralph I. Lloyd, 14 Eighth Ave., Brooklyn, N.Y., for Ophthalmology.

The Social Security Board released the following statement May 4, 1936. A total of 690,277 persons are expected to receive aid during the quarter ending June 30, 1936, under public-assistance plans so far approved by the Social Security Board. Included in the total number of persons to be aided are 528,694 needy aged, 18,750 needy blind, and 142,878 dependent children. To date, the Social Security Board has approved public-assistance plans in 18 States for aid to the blind. The total monthly expenditure, exclusive of administrative costs, for these three forms of public assistance in all States having approved plans is estimated to be $10,509,466.05, of which $8,638,752.42 is for aid to the needy aged, $478,845.04 is for aid to the blind, and $1,391,868.59 is for aid to dependent children. Under the terms of the Social Security Act, Federal funds are granted to States having public-assistance plans which conform with the requirements of the Federal act so that the States may provide more adequately for their needy dependents. The Federal allotments to the States pay half of any amount (not in excess of $30 a month to an individual) which the State grants to needy persons 65 years of age or over and to needy blind, provided these aged or blind persons are not inmates of public institutions. The Federal Government also adds five percent to its half in making its contribution to the States.

Societies

Dr. Rafael Silva has been appointed permanent secretary of the Sociedad Mexicana de Oftalmologia y Oto-Rino-Laringologia, in place of Dr. Daniel M. Velez, who died recently. Other officers of the society for the current year are: president, Dr. Antonio F. Alonso; vice-president, Dr. Mariano Olivares; annual secretary, Dr. Manuel Jose Icaza y Dublan; treasurer, Dr. Clementina Torres de Gonzalez Enriquez. It is hoped to renew publication of the Anales de la Sociedad Mexicana de Oftalmologia y Otorinolaringologia, which has been interrupted for some time.

At a meeting of the Eye Section of the Philadelphia County Medical Society on May 7, 1936, the following program was given: Mr. Lewis H. Carris, Managing Director of the National Society for the Prevention of Blindness, Nation-wide action on a nation-wide problem; Dr. H. Maxwell Langdon, Industrial vision and its preservation; Dr. Walter I. Lillie, Cosmetics detrimental to vision; Dr. Edwin B. Miller, Glaucoma and its relation to the conservation of vision.

Personals

Dr. C. W. Rutherford announces the removal of his office to 501 Hume-Mansur Building, 23 East Ohio Street, Indianapolis.

Dr. Arnold Pillat has been appointed director of the eye clinic at Graz, succeeding Dr. M. Salzmann, who has retired on account of having reached the age limit.